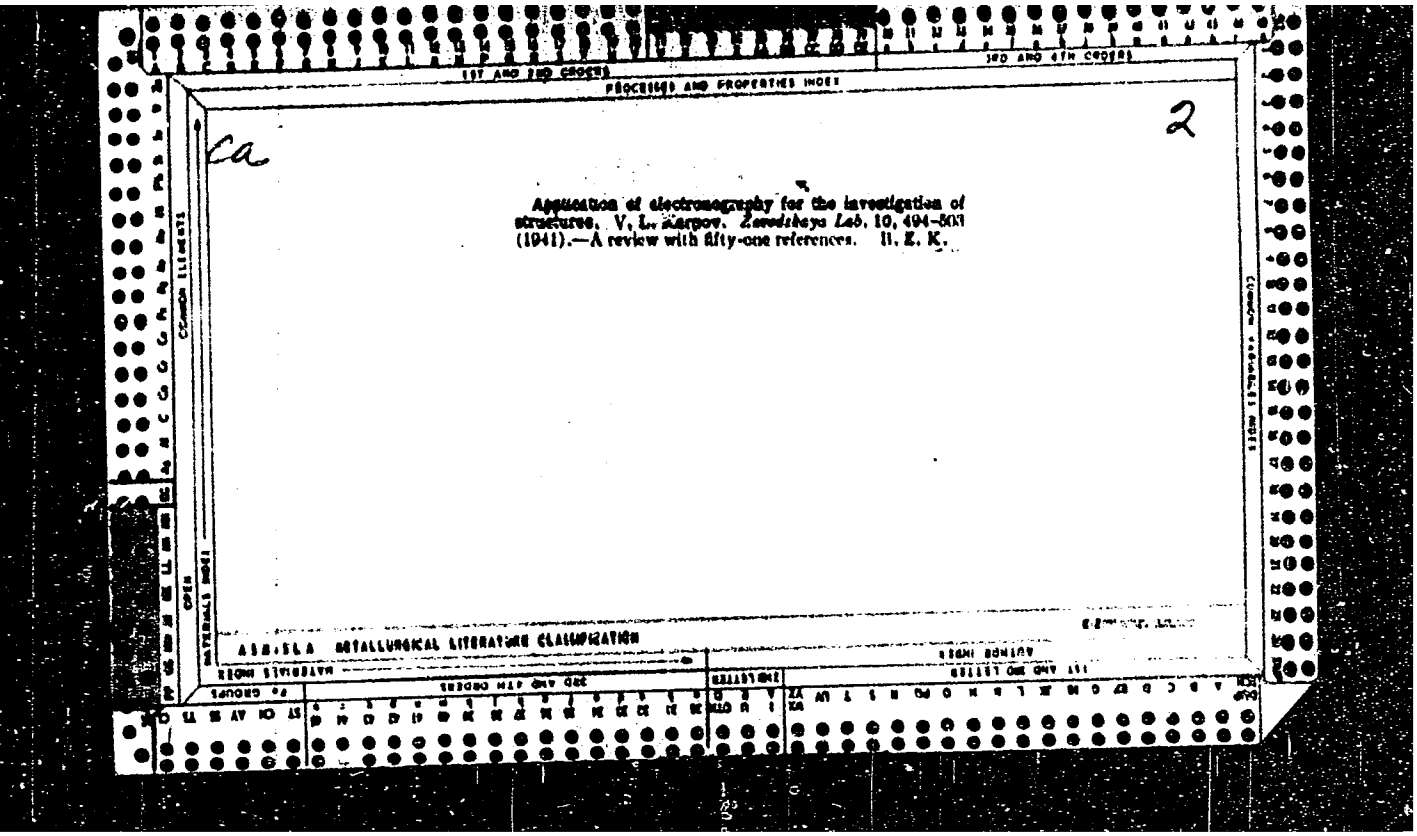
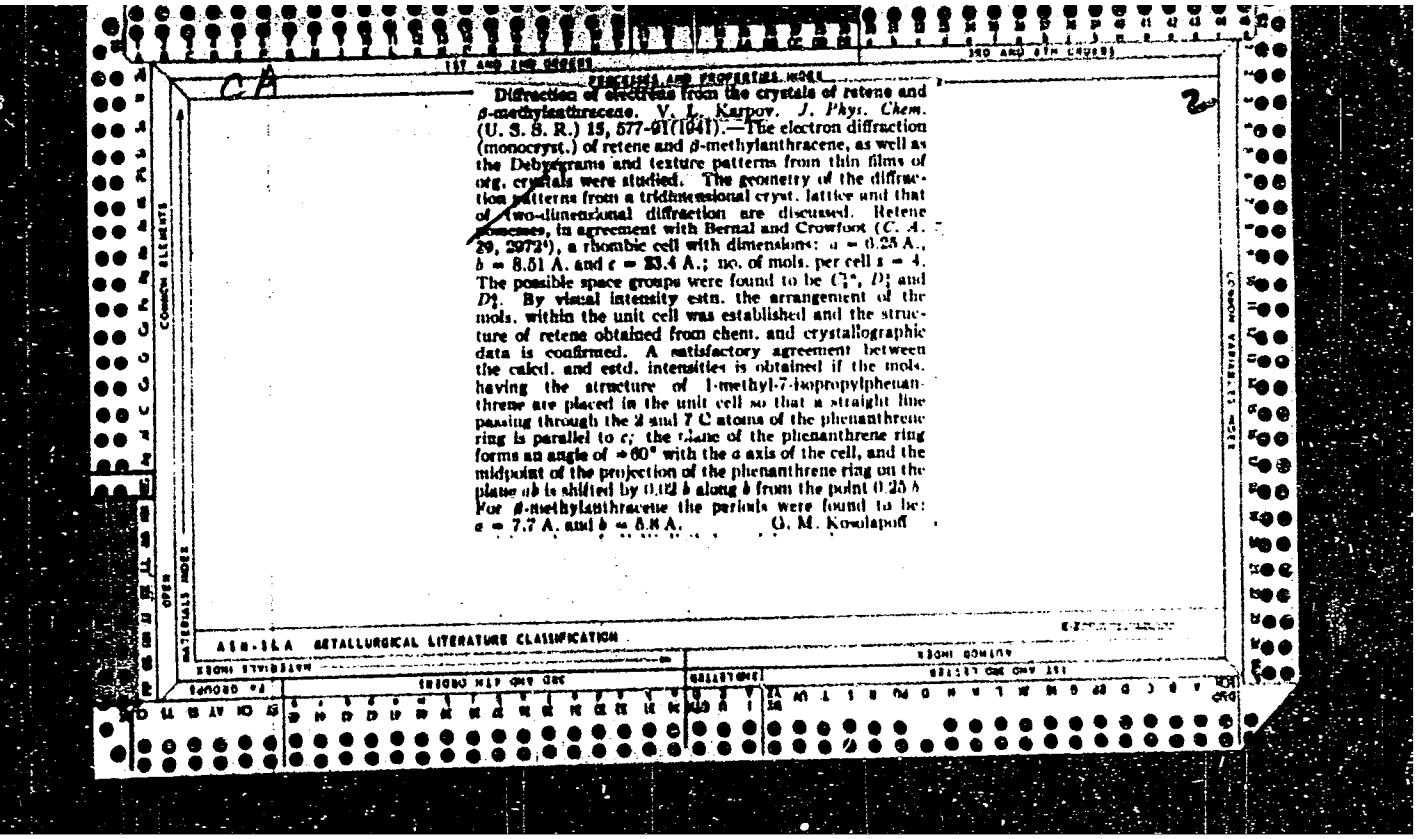


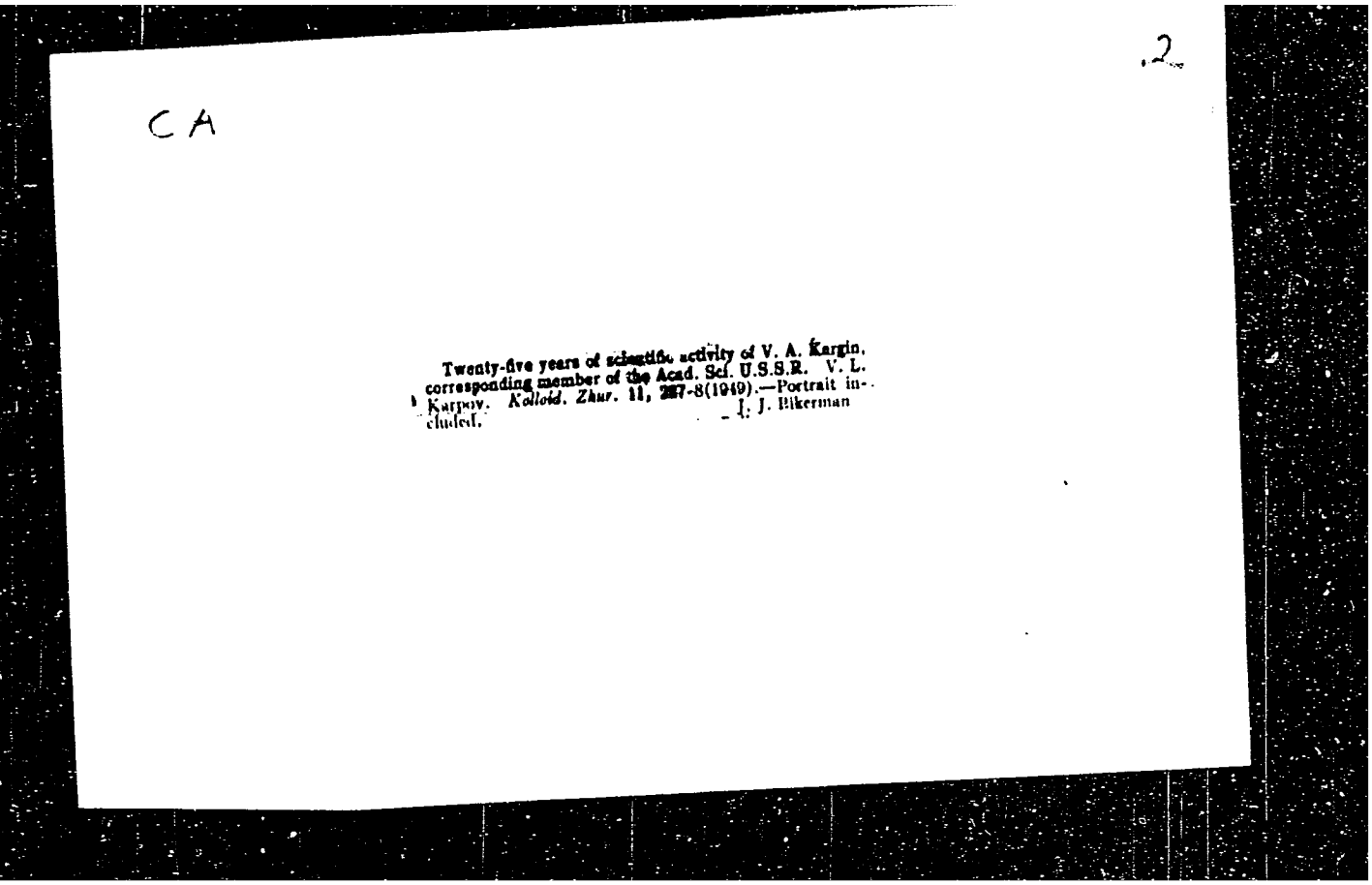
2

Application of electronography for the investigation of structures. V. L. Karpov. *Zavodskaya Lab.* 10, 494–500 (1941).—A review with fifty-one references. H. E. K.



CA

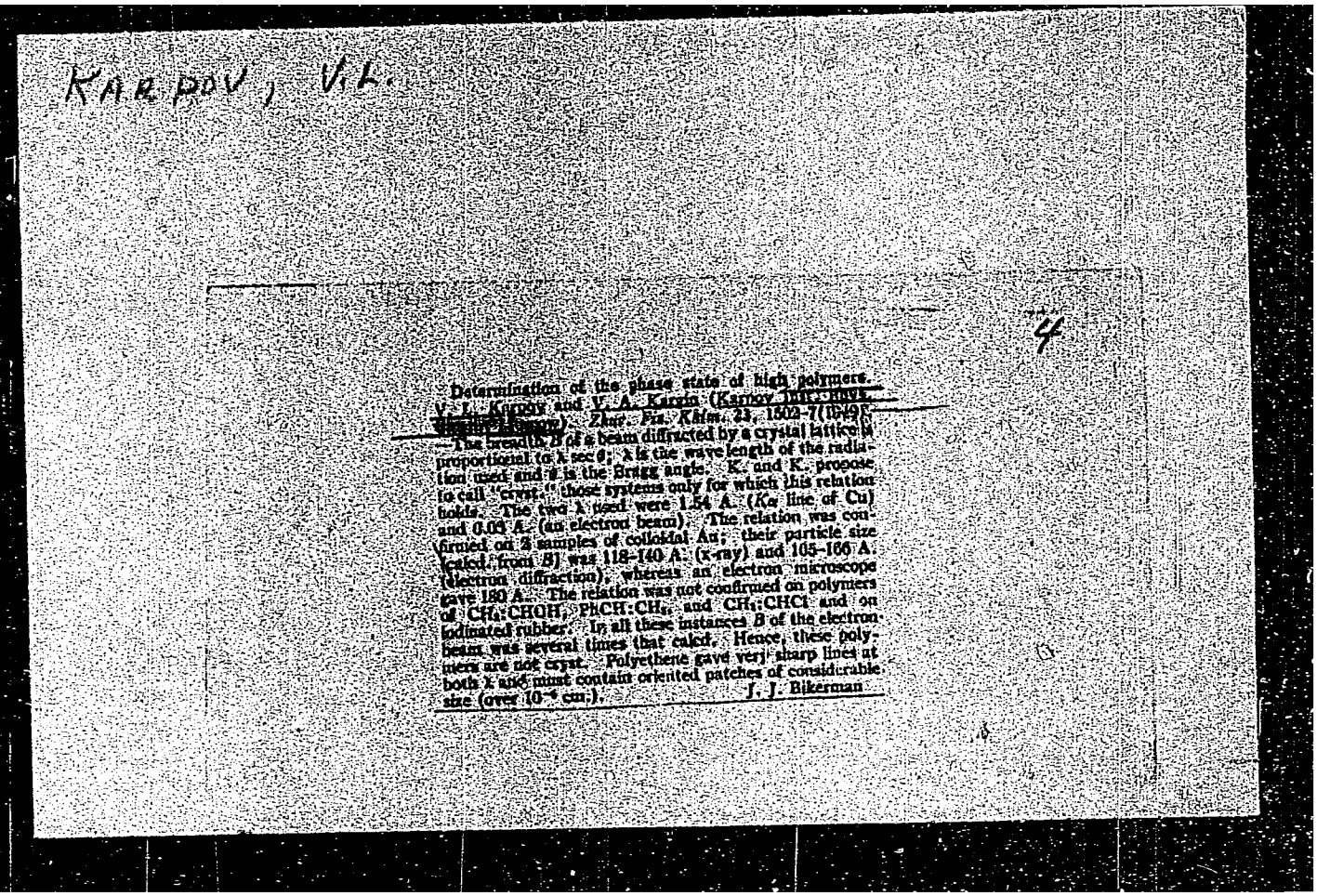
Diffraction of electrons from the crystals of retene and β-methylanthracene. V. L. Karpov. *J. Phys. Chem.* (U. S. S. R.) 15, 577-91(1941).—The electron diffraction (monocryst.) of retene and β-methylanthracene, as well as the Debyegrams and texture patterns from thin films of org. crystals were studied. The geometry of the diffraction patterns from a tridimensional cryst. lattice and that of two-dimensional diffraction are discussed. Retene crystallizes, in agreement with Bernal and Crowfoot (*C. A.* 29, 2972⁴), a rhombic cell with dimensions: $a = 0.25$ A., $b = 8.51$ A. and $c = 23.4$ A.; no. of mols. per cell $z = 4$. The possible space groups were found to be C_2^5, D_2^1 and D_2^4. By visual intensity estn. the arrangement of the mols. within the unit cell was established and the structure of retene obtained from chem. and crystallographic data is confirmed. A satisfactory agreement between the calcd. and estd. intensities is obtained if the mols. having the structure of 1-methyl-7-isopropylphenanthrene are placed in the unit cell so that a straight line passing through the 2 and 7 C atoms of the phenanthrene ring is parallel to c; the plane of the phenanthrene ring forms an angle of $\pm 60°$ with the a axis of the cell, and the midpoint of the projection of the phenanthrene ring on the plane ab is shifted by 0.02 b along b from the point 0.25 b. For β-methylanthracene the periods were found to be: $a = 7.7$ A. and $b = 8.8$ A. G. M. Kosolapoff



.2

CA

Twenty-five years of scientific activity of V. A. Kargin, corresponding member of the Acad. Sci. U.S.S.R. V. L. Karpov. *Kolloid. Zhur.* 11, 287-8(1949).—Portrait included. I. J. Bikerman

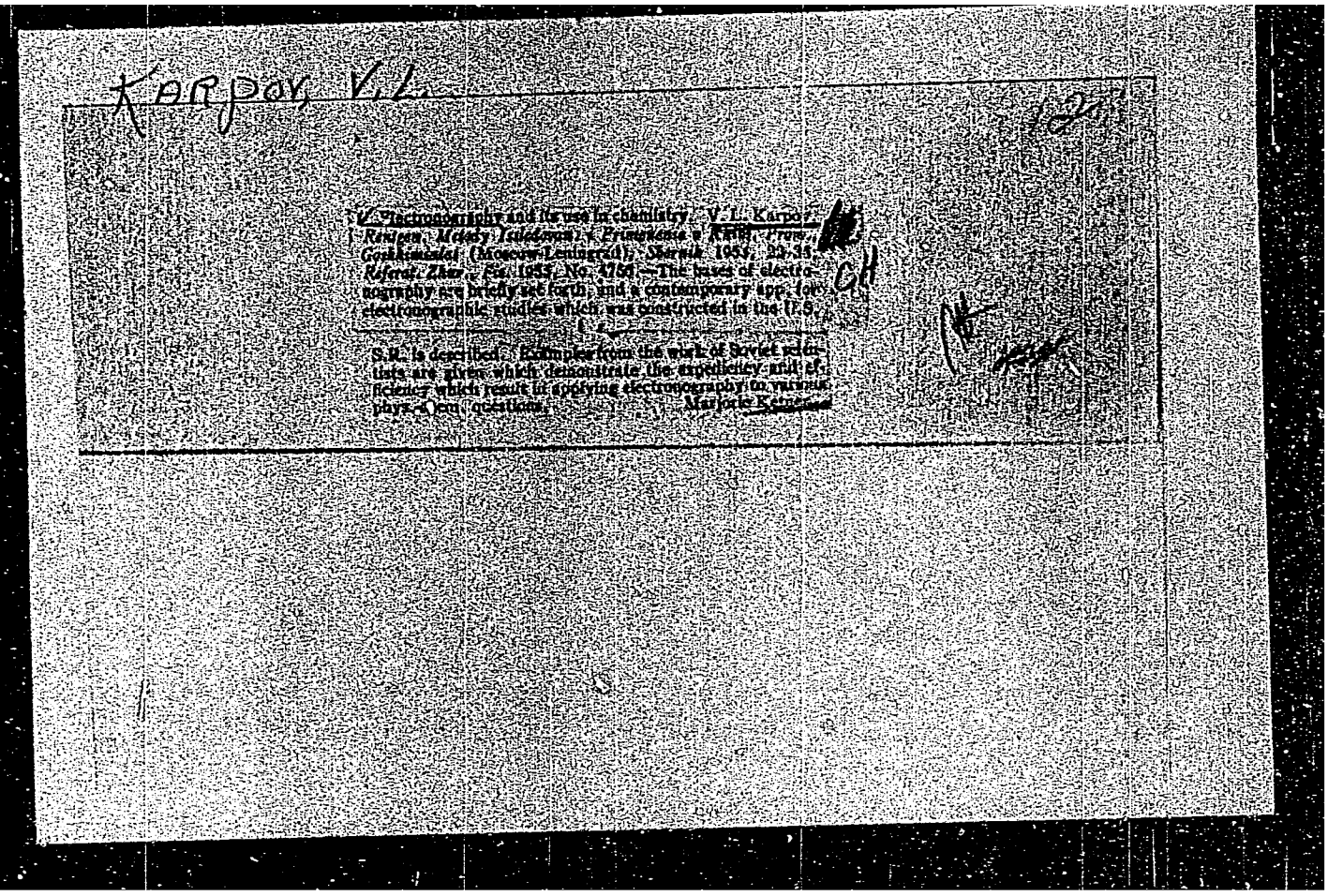


KARPOV, V.L.

4

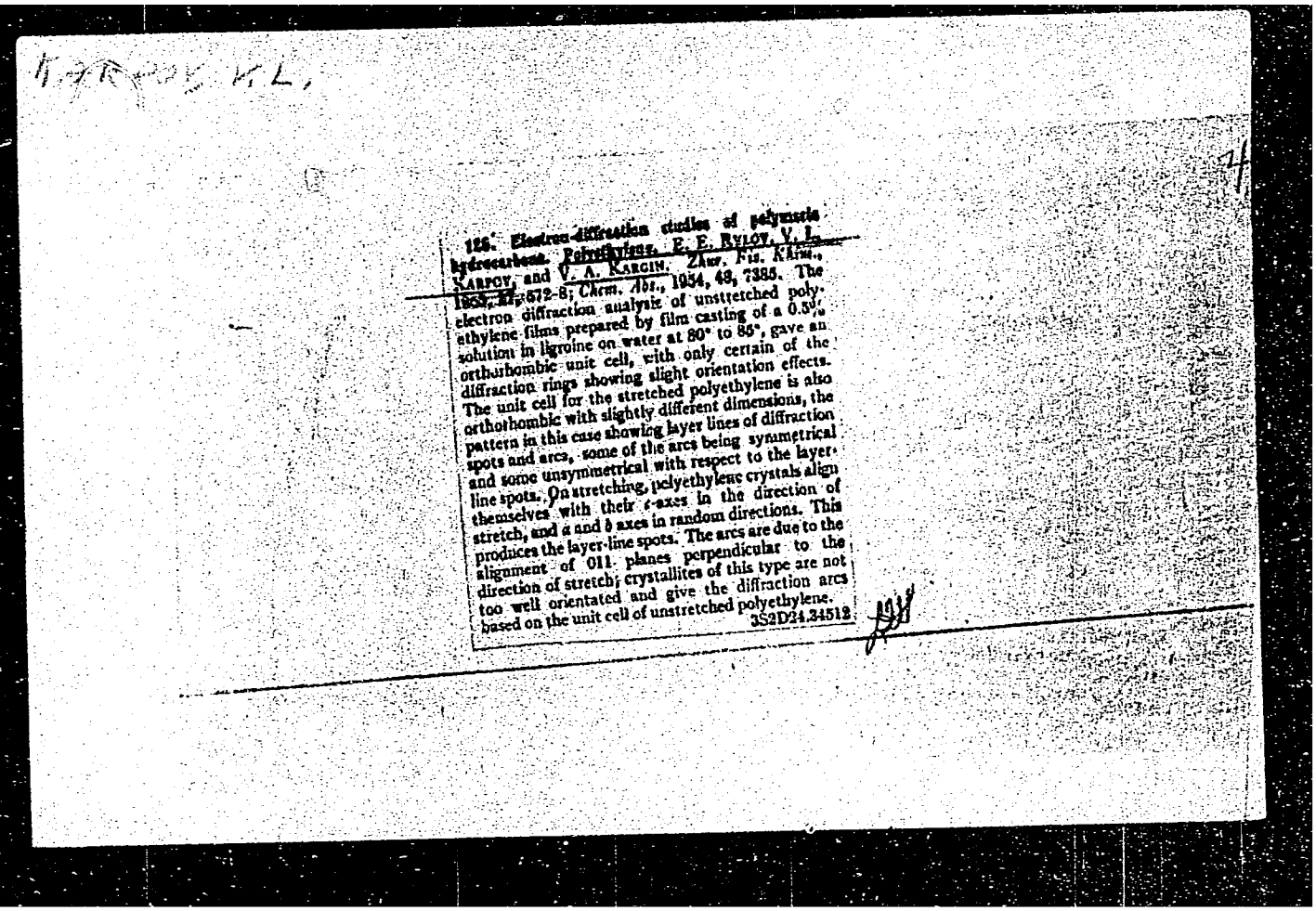
Determination of the phase state of high polymers. V. I. Kargin and V. A. Kargin (Karpov Phys.-Chem. Inst., Moscow). *Zhur. Fiz. Khim.*, 23, 1502-7(1949).—The breadth B of a beam diffracted by a crystal lattice is proportional to $\lambda \sec \theta$; λ is the wave length of the radiation used and θ is the Bragg angle. K. and K. propose to call "cryst." those systems only for which this relation holds. The two λ used were 1.54 A. ($K\alpha$ line of Cu) and 0.03 A. (an electron beam). The relation was confirmed on 2 samples of colloidal Au; their particle size (calcd. from B) was 118–140 A. (x-ray) and 165–166 A. (electron diffraction), whereas an electron microscope gave 180 A. The relation was not confirmed on polymers of CH_2:CHOH, PhCH:CH_2, and CH_2:CHCl and on sublimated rubber. In all these instances B of the electron-beam was several times that calcd. Hence, these polymers are not cryst. Polyethene gave very sharp lines at both λ and must contain oriented patches of considerable size (over 10^{-4} cm.).

J. J. Bikerman



Karpov, V. L.

Electrography and its use in chemistry. V. L. Karpov. *Rentgen, Metody Issledovan. i Primenenie v Khim. Prom.*, Goskhimizdat (Moscow-Leningrad), *Sbornik*, 1954, 33-35; *Referat. Zhur., Fiz.*, 1955, No. 4761.—The laws of electrography are briefly set forth, and a contemporary app. for electrographic studies, which was constructed in the U.S.S.R., is described. Examples from the work of Soviet scientists are given, which demonstrate the expediency and efficiency which result in applying electrography to various phys.-chem. questions. Marjorie Katzenstein



126. Electron-diffraction studies of polymeric hydrocarbons. Polyethylene. E. E. BYLOV, V. I. KARPOV and V. A. KARGIN. *Zhur. Fiz. Khim.*, 1953, 27, 672-8; *Chem. Abs.*, 1954, 48, 7385. The electron diffraction analysis of unstretched polyethylene films prepared by film casting of a 0.5% solution in ligroine on water at 80° to 85°, gave an orthorhombic unit cell, with only certain of the diffraction rings showing slight orientation effects. The unit cell for the stretched polyethylene is also orthorhombic with slightly different dimensions, the pattern in this case showing layer lines of diffraction spots and arcs, some of the arcs being symmetrical and some unsymmetrical with respect to the layer-line spots. On stretching, polyethylene crystals align themselves with their *c*-axes in the direction of stretch, and *a* and *b* axes in random directions. This produces the layer-line spots. The arcs are due to the alignment of 011 planes perpendicular to the direction of stretch; crystallites of this type are not too well orientated and give the diffraction arcs based on the unit cell of unstretched polyethylene.
3S2D24.34512

KARPOV, V. L.

7725

THE ACTION OF NUCLEAR RADIATIONS ON HIGH CH
POLYMERIC COMPOUNDS. V. L. Karpov. p.3-22 in
Meetings of the Division of Chemical Sciences. Session of
the Academy of Sciences of the U.S.S.R. on the Peaceful Use
Energy. July 1-5, 1955. Moscow, Publishing House of the
Academy of Sciences of the U.S.S.R., 1955. 373p. (In
Russian)

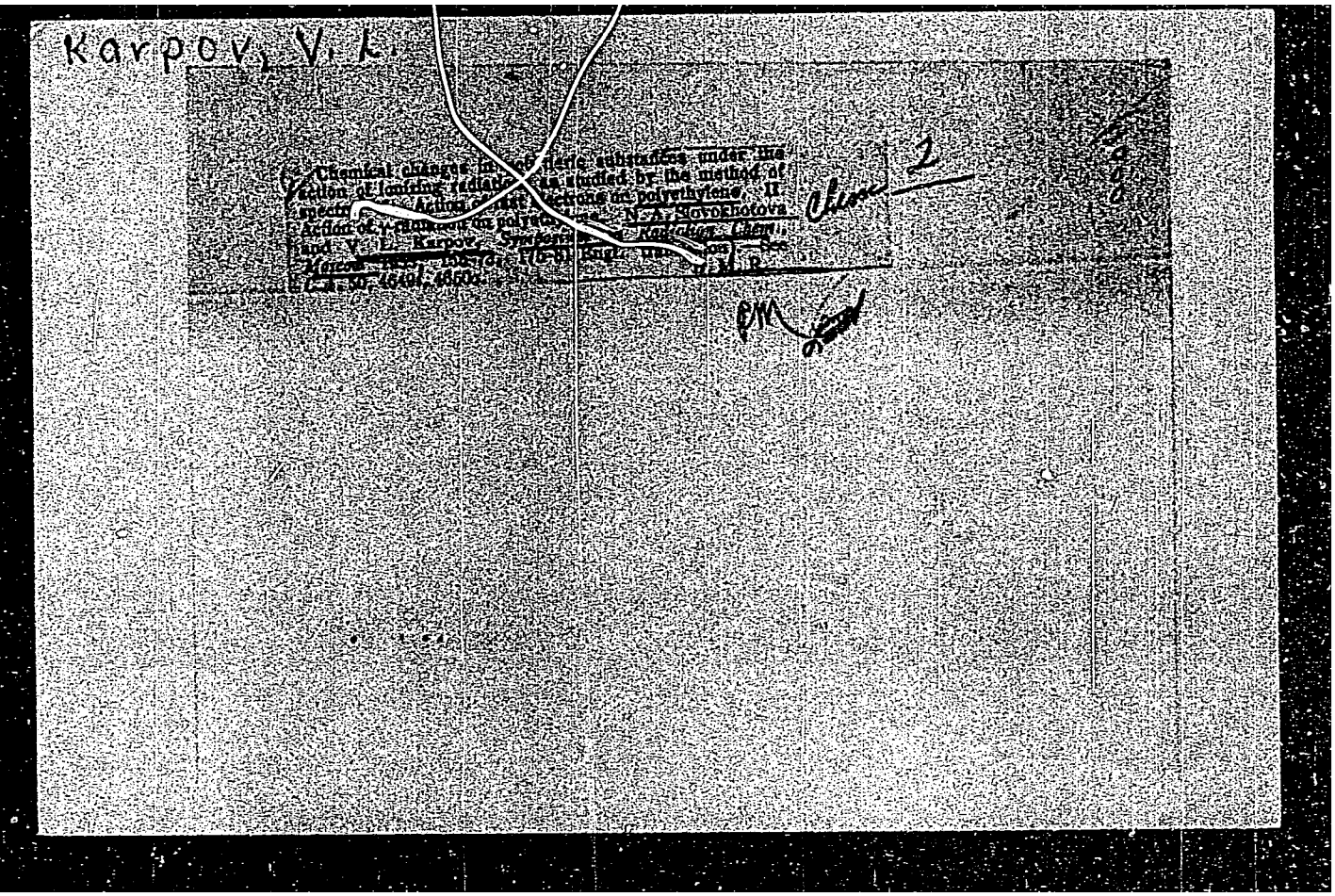
A survey is made of the reasons of the apparently insufficient reducing effect of atomic hydrogen when a reduction of nitrates in the solutions takes place. Experiments to determine initial efficiencies of this reaction are described which appeared to be approximately 2 molecules per 100 ev; the independence of this quantity of the pH is explained, and a description is given of the conditions under which the conjugated reaction proceeds with simultaneous oxidation of glucose and other substances, increasing the efficiency up to 13.5 equivalents. Cases of considerable increase of the efficiency of nitrate reduction, if the temperature is raised over 25°C, are cited, which also testifies to the participation, in the conditions, of excited water molecules. A consideration is made of these conditions of a reverse reaction of nitrite oxidation. The reaction of combining molecular nitrogen in the radiolysis of alkaline solutions is described. It is pointed out that a sharp increase of the velocity of back reaction takes place in case of heating irradiated solid potassium nitrate under a temperature exceeding the point of crystalline transition (129°C). Sensibilization of the reaction of oxidation of Fe^{2+} ions with participation of oxygen, when the acidity of the solutions is increased, is described. This makes it possible to achieve the maximum, up to 60 equivalents/100 ev, of Fe^{2+} oxidation efficiency independent of the nature of the acid (H_2SO_4, H_3PO_4, and HCl), oxygen pressure etc., which makes us think that this reaction has no chain character, but involves of up to 16 ionized and excited molecules of water. Investigations of radiation-chemical discoloration of methylene-blue water solutions are described. It is shown that in certain conditions there takes place either only the reduction of the dyestuff into a leuco-base with yield of 1.5 molecules per 200 ev, or only its irreversible oxidation with a yield of 1.6 molecules per 100 ev. Examples of sensibilization of the oxidation of benzene, benzyl alcohol and other compounds with the acids of ions of different valency are cited. The opinion is substantiated that the radical HO_2 is incapable of oxidizing aromatic com-

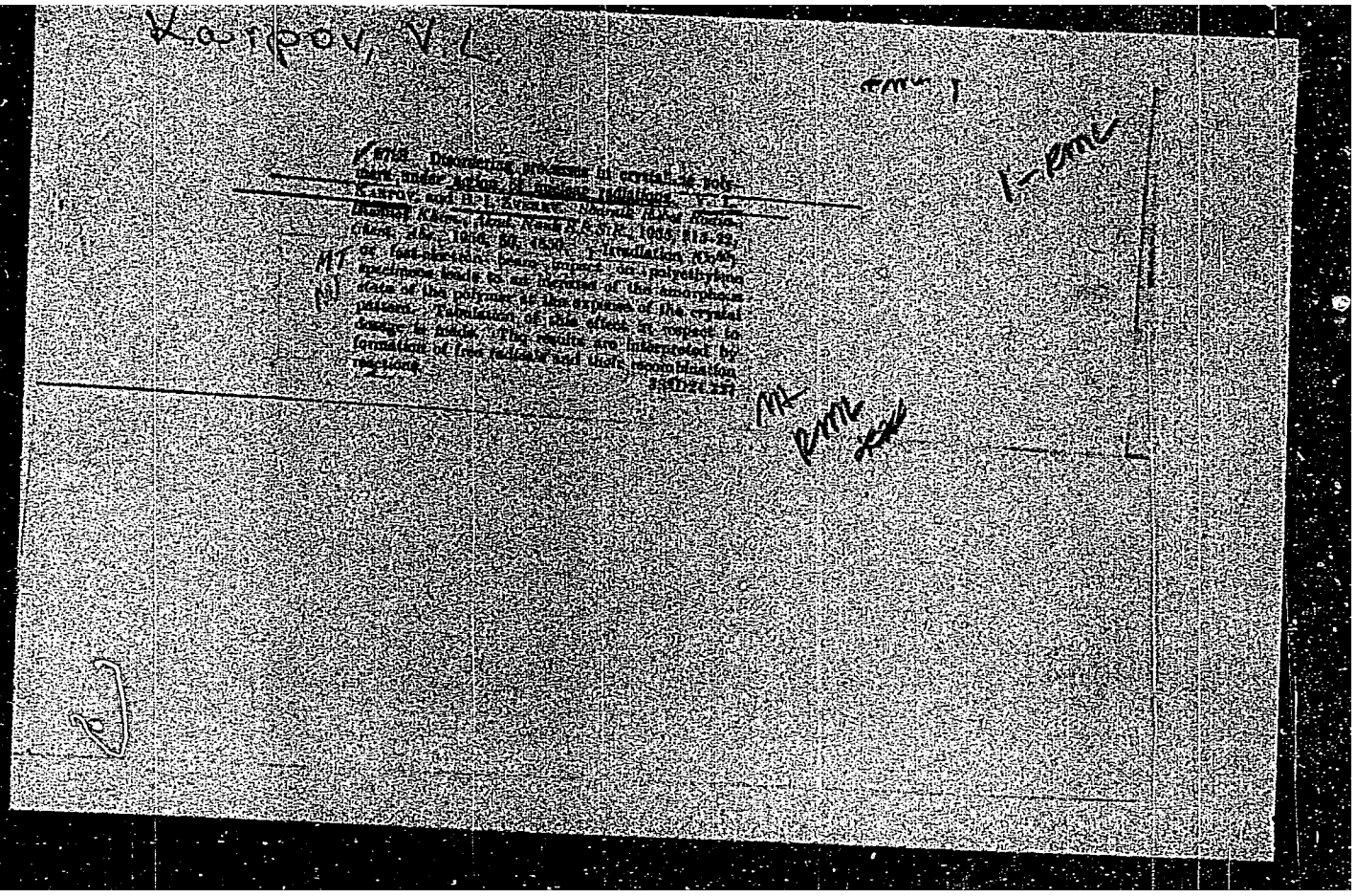
(over)

V.L. KARPOV

pounds without oxidation carriers and that in this case a phenton-type reaction takes place which leads to utilization of oxidizing properties of HO_2. The oxidation of benzyl alcohol anhydrous conditions results in efficiencies testifying to a chain character of this reaction that, in addition to this, allows a strong po[illegible]irradiatio[illegible] effect. The efficiencies of all described reactions in which participation of excited molecules is supposed to approximate the utilization of 15 molecules of water or 20 molecules of alcohol; this does not contradict with the estimated values of excitation energies. (auth)

Rhod MGT





KARPOV, V.L.

USSR/Chemistry - Physical chemistry

Card 1/1 Pub. 22 - 33/52

Authors : Kargin, V. A., Academician; Karpov, V. L.; Lipatov, Yu. S.; Markova, G. S.; and Koretskaya, T. A.

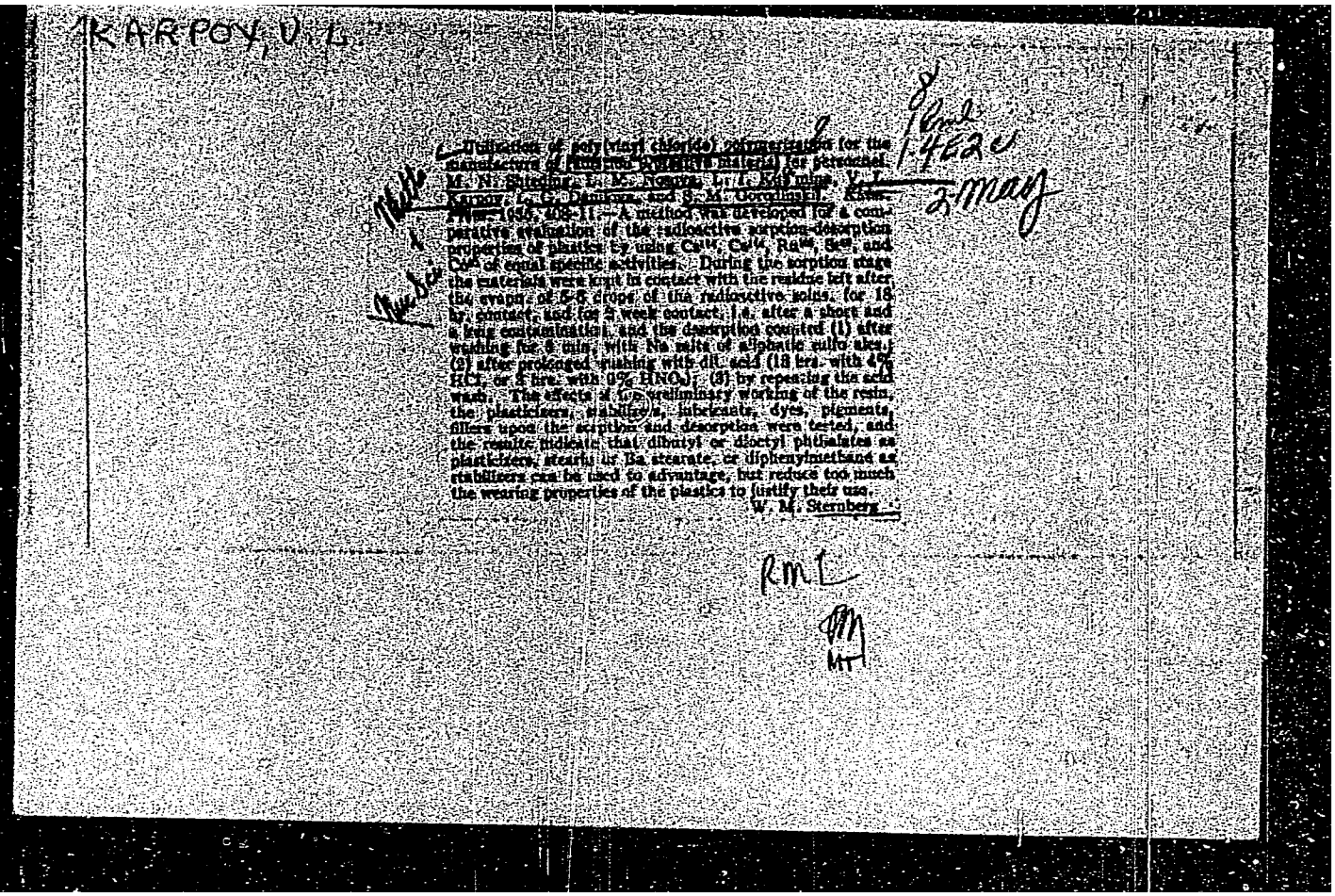
Title : About the phase condition of hydrate cellulose films

Periodical : Dok. AN SSSR 101/4, 707-709, Apr 1, 1955

Abstract : The phase condition of hydrate cellulose compounds obtained through three different methods was investigated by means of electrons with an energy of 90 kev. The existence of foreign crystalline inclusions in the cellulose films even after 3 days of thorough washing was established electronmicroscopically. A study of the entire conversion process - from isotropic, swollen hydrate cellulose into highly orderly arranged fibers - showed that the phase conversions do not affect the complete conversion process. The fact that cellulose compounds are amorphous was confirmed. Thirteen references: 10 USSR, 2 German and 1 USA (1917-1953). Table; illustrations.

Institution : .....

Submitted : November 11, 1954



KARPOV, V. L.

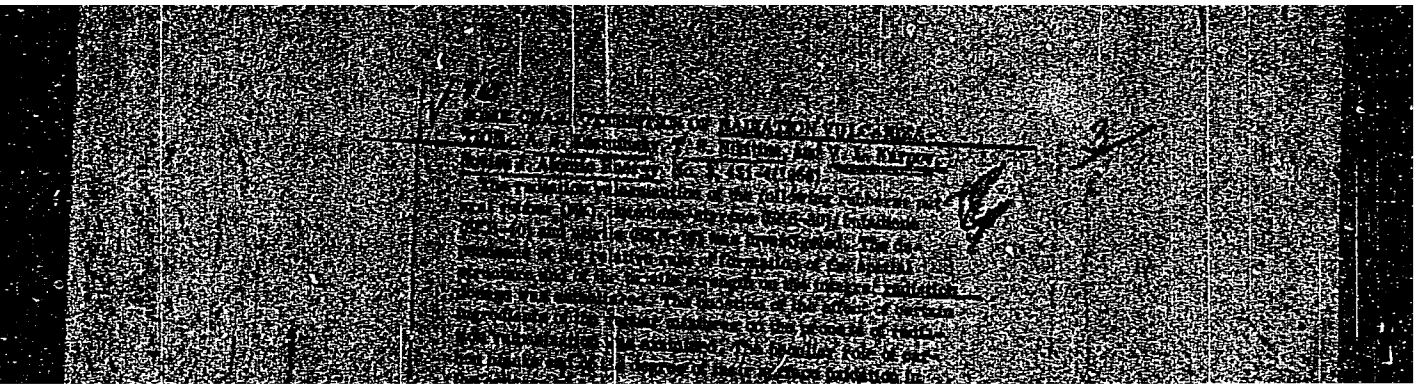
Utilization of polyvinyl chloride) polymerizates for the manufacture of [illegible] materials for personnel. M. N. Shreider, L. M. Kozlova, L. I. Kul'kina, V. L. Karpov, L. G. Dunikova, and S. M. Gorgunskii. Plast. Massy 1958, 408-11.—A method was developed for a comparative evaluation of the radioactive sorption-desorption properties of plastics by using Ca^{45}, Ce^{144}, Ra^{226}, Sr^{90}, and Cs^{137} of equal specific activities. During the sorption stage the materials were kept in contact with the residue left after the evapn. of 5-6 drops of the radioactive solns. for 18 hr. contact, and for 2 week contact, i.e. after a short and a long contamination, and the desorption counted (1) after washing for 5 min. with Na salts of aliphatic sulfo acs.; (2) after prolonged washing with dil. acid (18 hrs. with 4% HCl, or 5 hrs. with 0% HNO_3); (3) by repeating the acid wash. The effects of the preliminary working of the resin, the plasticizers, stabilizers, lubricants, dyes, pigments, fillers upon the sorption and desorption were tested, and the results indicate that dibutyl or dioctyl phthalates as plasticizers, stearin or Ba stearate, or diphenylmethane as stabilizers can be used to advantage, but reduce too much the wearing properties of the plastics to justify their use.

W. M. Sternberg

KARPOV, V. L.

Electron microscope investigation of the shape and size of macromolecules. E. A. Koretskaya and V. L. Karpov. *Doklady Akad. Nauk S.S.S.R.* 111, 831-4(1956). Samples were prepd. for electron microscope examn. by applying a dil. polymer soln. upon a film of some material capable of swelling in the solvent used. The drop was removed from the film after several hours in an atm. satd. with the vapors of the solvent, in the hope that some of the mols. would settle and become adsorbed on the film after the solvent was removed. Atoms of high at. no. were introduced into the mols. in order to increase the sharpness of the picture, and Th polyacrylate and polymethacrylate were the macromols. investigated. The calcd. diam. of the Th polymethacrylate was of the order of 100 A. The electron microscope photographs reproduced were at a magnification of 48,400, and 84,000, and show no stretched out mols., but have a max. wst. shape.

W. M. Sternberg



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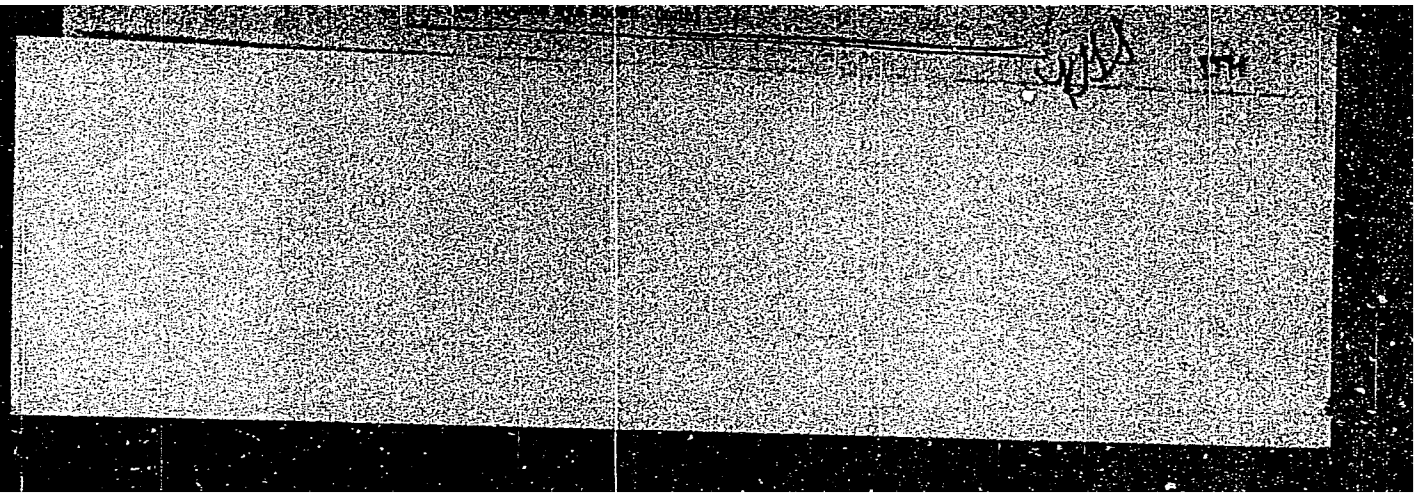
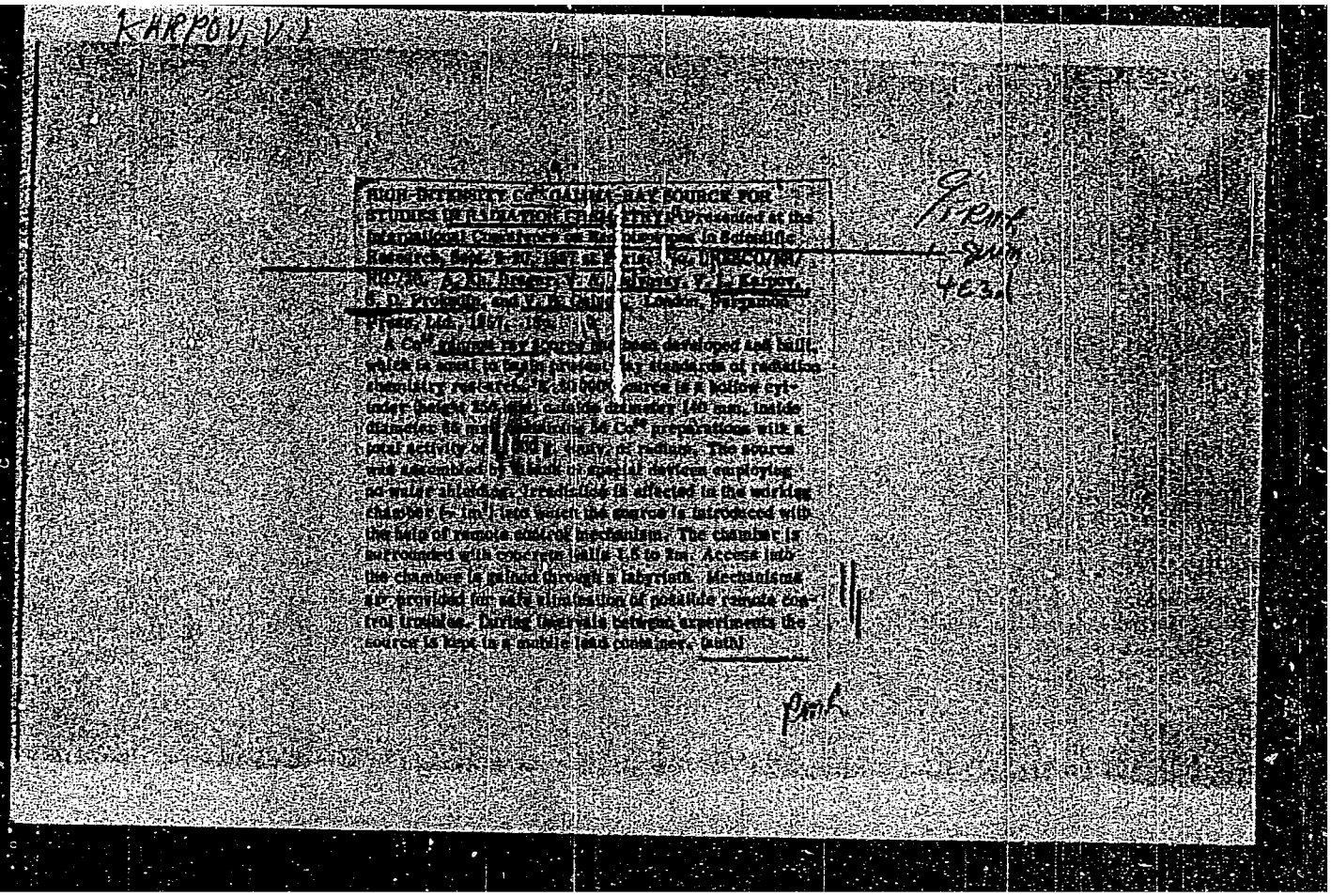


KARPOV, V. L.

"The Investigations of the Radiation Stability of High Polymers."

report presented at Scientific Conference at the Inst. for Physical Chemistry imeni L. Ya. Karpov, Acad. Sci. USSR, Nov. 1957.



KARPOV, V.I.

[illegible] SOURCE FOR STUDIES OF RADIATION [illegible] presented at the International Conference on the Uses of [illegible] in Scientific Research, Sept. 8-20, 1957 [illegible] No. [illegible]/57/7 RU/P/G. A.D. Zhukovskiy, V.I. Karpov, V.A. Kuznetsov, V.G. Safronov, E.D. Prokhorov, and V.N. Shishkin. London, Pergamon Press, 1958. 1176 p.

A Co[60] gamma ray source has been developed and built, which is useful in [illegible] standards of radiation chemistry research. A 30,000 curie source of a hollow cylinder height 400 mm, outside diameter 140 mm, inside diameter 80 mm, containing 14 Co[60] preparations with a total activity of [illegible] curies of radium. The source was assembled by [illegible] special devices employing no-water shielding. Irradiation is effected in the working chamber (6 liters) into which the source is introduced with the help of remote control mechanisms. The chamber is surrounded with concrete walls 1.5 to 2m. Access into the chamber is gained through a labyrinth. Mechanisms are provided for safe elimination of possible remote control troubles. During intervals between experiments the source is kept in a mobile lead container. (auth)

KARPOV, V.L. , GORODINSKIY, S.M., MOSKVA, L.V., SHTEBEVA, V.N.

"Selection of Plastic Polymer Materials for Use in Equipment for Personal Protection". p. 28

Trudy Vsesoyuznoy Konferentsii po Meditsinskoy Radiologii (Voprosy Gigiyeny i Dozimetrii) Medgiz, 1957, Moscow Russian , 0K.

Proceedings of the All-Union Conference on Medical Radiology (Hygienic and Dosimetric Problems).

KARPOV, V. L.

Some aspects of the vulcanization of rubber by [irradiation.] A. S. Kuzminskii, V. S. Nikitin, and V. L. Karpov. *Atomic Energy* (U.S.S.R.) (English translation) 1, No. 3, 137 (1956) (Pub. in *J. Nuclear Energy* 4, 268-72 (1957)). Natural rubber (NR), butadiene-styrene (SKS-30) butadiene (SKB-40)-acrylonitrile (SKN-26) were studied. Irradiation was performed with X-rays from a tube running at 200 ma. and 3 kv. on samples in the form of pressed sheets 0.3-0.4 mm. thick in cellophane packets. An amt. of radiation of 3×10^5 r.e.p. increased the elastic modulus E(kg./sq. cm.) by 15, 24, 46, and 57 units for the unfilled rubbers in the order given above. The rate of vulcanization by irradiation of SKS-30 was greatly influenced by additives. Fifty parts of kaolin gave E 3.5 times the value without the additive, while 5 parts of ZnO was only half as effective. S and diphenylguanidine addns. proved even less effective. C had a large effect on polymerization during vulcanization under irradiation. It is assumed that the radiation-induced cross-linking is caused by chem. bonding between the rubber and the small particles of C.

James L. Lauer

KARPOV, V.L.

PHASE I BOOK EXPLOITATION SOV/1297

Vsesoyuznaya nauchno-tekhnicheskaya konferentsiya po primeneniyu radioaktivnykh i stabil'nykh izotopov i izlucheniy v narodnom khozyaystve i nauke, Moscow, 1957

Polucheniye izotopov. Moshchnyye gamma-ustanovki. Radiometriya i dozimetriya; trudy konferentsii... (Isotope Production. High-energy Gamma-Radiation Facilities. Radiometry and Dosimetry; Transactions of the All-Union Conference on the Use of Radioactive and Stable Isotopes and Radiation in the National Economy and Science) Moscow, Izd-vo AN SSSR, 1958. 293 p. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR; Glavnoye upravleniye po ispol'zovaniyu atomnoy energii SSSR.

Editorial Board: Frolov, Yu.S. (Resp. Ed.), Zhavoronkov, N.M. (Deputy Resp. Ed.), Aglintsev, K.K., Alekseyev, B.A., Bochkarev, V.V., Leshchinskiy, N.I., Malkov, T.P., Sinitsyn, V.I., and Popova, G.L. (Secretary); Tech. Ed.: Novichkov, N.D.

PURPOSE: This collection is published for scientists, technologists, persons engaged in medicine or medical research, and others concerned with the production and/or use of radioactive and stable isotopes and radiation.

COVERAGE: Thirty-eight reports are included in this collection under three main subject divisions: 1) production of isotopes 2) high-energy gamma-radiation facilities, and 3) radiometry and dosimetry.

TABLE OF CONTENTS:

PART I. PRODUCTION OF ISOTOPES

This report is a general survey of production methods, apparatus, raw materials, applications, investigations and future prospects for radio isotopes in the Soviet Union.

Card 2/12

A K-20000 Co^{60} gamma-radiation source, cited as the most powerful in the world according to available data, is described and basic parameters tabulated. The unit is provided with a control panel and a system of periodic observation and is capable of 1200 r/sec dosage per 0.4 liters and ~100 r/sec per 100 liters volume. Working chamber capacity is ~300 liters. The source, comprising 56 standard Co^{60} preparations, the authors state, is safe for attending personnel owing to a "dry" method especially developed for this unit.

Card 8/12

KARPOV, V. L., ZVEREV, B. I. and LESHCHENKO, S.S.

"Processes of Phase Transformations in Polymers Under the Action of Nuclear Radiation"

KARPOV, V. L., and PETROV, I. Ya.

"Investigation of Gas-emission Processes in the Action of Nuclear Radiatinn on Polymers."

Truiy Transactions of the First Conference on Radioaction Chemistry, Moscow, Izd-vo AN SSSR, 1958. 330pp.
Conference -25-30 March 1957, Moscow

SOV/58-59-8-17760

Translated from: Referativnyy Zhurnal Fizika, 1959, Nr 8, p 112 (USSR)

AUTHORS: Nikitina, T.S., Kuz'minskiy, A.S., Karpov, V.L.

TITLE: The Radiation Vulcanization of Caoutchoucs

PERIODICAL: V sb.: Deystviye ioniziruyushchikh izlucheniy ne neorgan. i organ. sistemy. Moscow, AN SSSR, 1958, pp 333-343

ABSTRACT: The article has not been reviewed.

Card 1/1

SOV/81-59-21-74749

Translation from: Referativnyy zhurnal, Khimiya, 1959, Nr 21, p 158 (USSR)

AUTHORS: Breger, A.Kh., Belynskiy, V.A., Karpov, V.L., Prokudin, S.D.

TITLE: Installations for Radiochemical Investigations. 19 Comm. II. An Installation Ensuring a Dose Intensity of up to 300 Roentgen/sec in a Volume of 30 ml and of up to 100 Roentgen/sec in 1 l With a Co^{60} γ-Radiation Source With an Intensity of 1,400 g-equ Radium

PERIODICAL: V sb.: Deystviye ioniziruyushchikh izlucheniy na neorgan. i organ. sistemy. Moscow, AS USSR, 1958, pp 379 - 394

ABSTRACT: This is a review of installations for irradiation with the γ-radiation of Co^{60} in radiochemical investigations as well as a description of the K—1400 installation of the Physical-Chemical Institute imeni Karpov with a Co^{60} γ-radiation source with an intensity of 1,440 g-equ Ra ensuring a dose intensity of 300 roentgen/sec in a volume of 30 ml and 100 roentgen/sec in 1 l. The installation has been developed based on the requirements of the modern radiochemical experiment; it is equipped

Card 1/2

AUTHORS: Tarasova, Z.N., Kaplunov, M.Ya., Dogadkin, B.A., ~~Karpov, V.L.~~, Breger, A.Kh.

SOV/138-58-5-4/9

TITLE: Vulcanisation by Nuclear Radiation (Vulkanizatsiya pod vozdeystviyem yadernykh izlucheniy)

PERIODICAL: Kauchuk i Rezina, 1958, Nr 5, pp 14-21 (USSR)

ABSTRACT: During recent years it was found that polymeric materials undergo deep structural changes when irradiated with high energy rays (x-rays and nuclear radiation). Investigations on the vulcanisation of rubbers and rubber mixtures by radioactive irradiation were carried out (Refs.1-7). This method of vulcanisation is called "radiation" vulcanisation. The authors investigated the structure and the properties of radiation vulcanisates obtained by irradiating rubbers and their mixtures in an atomic reactor and by gamma radiation from Co^{60}. They also determined the conditions for preparing the homogeneous

Card 1/5

Vulcanisation by Nuclear Radiation

solid and multi-layer articles (tyres) by the action of nuclear radiation. The following rubbers were tested: natural, butadiene-styrene SKS-30A and SKS-30AM, isoprene SKI and sodium-butadiene SKN. The rubbers were vulcanised in thin layers in steel or aluminium moulds. The degree of cross-linking of the molecular chains of rubber during irradiation vulcanisation depends on the admixtures in the rubber and on the molecular weight of the rubber and is also affected by the presence of oxygen. The influence of the medium in which radiation takes place on the degree of structure formation of purified natural rubber during radiation vulcanisation is shown graphically in Fig.1; the influence of the medium on the kinetic formation of cross-links during radiation vulcanisation is tabulated (Table 1). On studying the infra-red spectra it was noted that the presence of phenyl-β-naphthylamine strongly inhibited the oxidation processes during irradiation. Spectra of electron paramagnetic resonance showed that samples of SKS-30AM irradiated on air had increased

Vulcanisation by Nuclear Radiation

content of free radicals (Table 3). The effect of anti-oxidants on the properties of radiation vulcanisates is due, to a considerable extent, to the decreased number of double bonds in the presence of anti-oxidants. Fig.2: the relaxation of tension of rubbers subjected to radiation vulcanisation in air; Fig.3: the dependence of the constant of the rate of relaxation of the above vulcanisates on the number of cross-links. Due to the high power of penetration of nuclear rays, uniform vulcanisation is achieved throughout the sample (Table 4). The thickness of the vulcanising grate is defined by the dosage of absorbed energy, by the type and composition of the rubber, by the amount of fillers, plasticisers and anti-oxidants in the mixture and the conditions of irradiation as well as by some other factors. The radiation vulcanisates show thermo-mechanical stability surpassing the stability of vulcanisates containing thiuram. Activated carbon decreases the rate of chemical relaxation of radiation vulcanisates.

Card 3/5

Vulcanisation by Nuclear Radiation

During the irradiation of purified rubbers intense oxidation occurs; this leads to complete loss of unsaturation when the dosage of irradiation = 60 mega roentgen. In this case the amount of double bonds is decreased to 30%. Conditions for preparing homogeneous vulcanisation grates were found to be independent from the thickness of the samples (within the limits of 0.1 - 40 mm). The physico-mechanical and technological properties of rubbers prepared by vulcanisation radiation were tested (Table 5). It was found that these vulcanisates were more resistant to thermo-oxidative ageing than sulphur-vulcanisates (4 - 5 times at 130°C), undergo small residual deformation, show low hysteresis and high recovery when subjected to repeated deformation. The vulcanisation of model tyre casings 7.50 x 20, 1/5th natural size, was carried out (Fig.8). Changes in the physico-mechanical characteristics of various tyre cords during irradiation in an atomic reactor are given in Table 7. Members of the Institute

Card 4/5

AUTHORS: Dogadkin, B.A.; Tarasova, Z.N.; Kaplunov, M.Ya.; Karpov, V.L.; Klauzen, N.A.

69-20-3-2/24

TITLE: The Structure and Properties of Rubbers Produced in Irradiation Vulcanization (Struktura i svoystva rezin, poluchennykh pri radiatsionnoy vulkanizatsii)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 260-271 (USSR)

ABSTRACT: The vulcanization of rubber products by different nuclear radiation sources has aroused great interest in the last years. The irradiated rubber products usually show better mechanical and chemical properties than those vulcanized by present methods. Rubbers of the types SKS-30A, SKI, SKB, and natural rubber were tested. The samples were irradiated in an atomic reactor or by a Co^{60} source with a dose of 10^7-10^8 r. The investigation of the infrared absorption spectra has shown that in the 5.8 μ field a broad absorption band corresponds to the carbonyl groups of acids, aldehydes, and ketones. In the 2.8 μ field the absorption band of the hydroxyl groups is shown. The density of the network formed during irradiation vulcanization is determined by the energy dose absorbed, by the type and the composition

Card 1/3

Karpov, V. L.

AUTHORS: Varshavskiy, Ya. M., Vasil'yev, G. Ya., Karpov, V. L., Lazurkin, Yu. S., Petrov, I. Ya., 20-2-31/60

TITLE: On Isotopic Exchange Between Gaseous Hydrogen and Solid Polymers Under the Action of Nuclear Radiation (Ob izotopnom obmene mezhdu gazoobraznym vodorodom i tverdymi polimerami pri deystvii yadernykh izlucheniy)

PERIODICAL: Doklady AN SSSR, 1958, Vol. 118, Nr 2, pp. 315-316 (USSR)

ABSTRACT: In the case of irradiation of polymeric hydrocarbons gaseous products, which mainly conatain hydrogen, are separated out. The explanation of the problem of the reversibility of the corresponding process, i.e. of the possibility of the penetration of hydrogen from the gaseous phase into the molecules of the polymer during the irradiation would be desirable. The authors tried to explain this problem by the method of the marked atoms, using deuterium; they studied the exchange of isotopes between the gaseous deuterium and various solid polymers in the radiation field of a nuclear rector. The following polymers of the vinyl-series were examined: Polyethylene, polypropylene, polystyrol, divinyl-caoutchouc, polymethyl-metacrylate. The performance of

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the measurements is described shortly. A table illustrates the effectively found percentage of deuterium in the above given polymerics after the irradiation. The results of various parallel measurements differ at the most for o,o2 per cent. On occasion of all these polymers it was shown in particular that the penetration of deuterium is not connected with the adsorption of gaseous deuterium. The control tests, which were made for this purpose, showed that, if there is no radiation, no dueterium was found in the polymer. The effects, observed here, obviously are cuased by a chemical interaction between the molecules of the polymer and the molecules of the deuterium on occasion of the action of deuterium. The highest quantity of deuterium penetrated into polyethylene and into polypropylene. In polybutadiene and polystyrol the exchange is some what slower, whereas in the case of polymethyl-metacrylate no signs were noticed of an exchange. At present a mechanism with the formation of free radicals, is assumed for polyethylene: $R\text{-}CH_2\text{-}R_1\text{-}\sim \rightarrow R\text{-}\dot{C}H\text{-}R_1 + H$. Probably the deuterium penetrates in the case examined here because of a reaction between a polymeric radical and a deuterium molecule into the polymer: $\dot{R} + D_2 \longrightarrow RD + D$, $RH + D \longrightarrow \dot{R} + HD$. The equili-

KAAPOV, V.L.

(4) PHASE I BOOK EXPLOITATION SOV/2713

International Conference on the Peaceful Uses of Atomic Energy. 2nd, Geneva, 1958

Doklady sovetskikh uchenykh; polucheniye i primeneniye izotopov (Reports of Soviet Scientists; Production and Application of Isotopes) Moscow, Atomizdat, 1959. 388 p. (Series: Its: Trudy, vol. 6) 8,000 copies printed.

Eds. (Title page): G.V. Kurdyumov, Academician, and I.I. Novikov, Corresponding Member, USSR Academy of Sciences; Ed. (Inside book): Z.D. Andreyenko; Tech. Ed.: Z.D. Andreyenko.

PURPOSE: This book is intended for scientists, engineers, physicians, and biologists engaged in the production and application of atomic energy to peaceful uses; for professors and graduate and undergraduate students of higher technical schools where nuclear science is taught; and for the general public interested in atomic science and technology.

COVERAGE: This is volume 6 of a 6-volume set of reports delivered by Soviet scientists at the Second International Conference on the Peaceful Uses of Atomic Energy held in Geneva from September 1 to 13, 1958. Volume 6 contains 32 reports on: 1) modern methods for the production of stable radioactive isotopes and their labeled compounds, 2) research results obtained with the aid of isotopes in the field of chemistry, metallurgy, machine building, and agriculture, and 3) dosimetry of ionizing radiation. Volume 6 was edited by: S.V. Levinskiy, Candidate of Medical Sciences; V.N. Prusakov, Candidate of Chemical Sciences; and V.T. Sedov, Candidate of Medical Sciences. See Sov/2081 for titles of volumes of the set. References appear at the end of the articles.

25(5) 06210
SOV/64-59-6-2/28

AUTHORS: Karpov, V. L., Malinskiy, Yu. M., Mitrofanova, L. V., Sinitsyn, S. T., Finkel', E. E., Fridman, A. S., Chernstsov, S. M.

TITLE: Increase in the Thermostability of the Polyethylene Insulation of Cables by Means of Exposure to Ionizing Radiation

PERIODICAL: Khimicheskaya promyshlennost', 1959, Nr 6, pp 468 - 474 (USSR)

ABSTRACT: The thermostability of polyethylene can be increased by the action of ionizing radiations (Ref 1). Polyethylene exposed to a sufficiently large dose of radiation at 110-115° possesses properties similar to those of rubber (Ref 3). An investigation was made of the irradiation conditions and testing methods of cables (1 mm thick copper wire) insulated with polyethylene (type OKhK-501). The insulating material was exposed to γ-rays of Co^{60} (gamma plant "K-20000" (Ref 8)) with a capacity of 0.6-0.9 Mrad/h or to fast electrons from a linear accelerator of 1 Mev. The tensile strength of the exposed samples was tested by means of a dynamometer designed by V. A. Belynskiy, S. D. Prokudin, and B. I. Zverev at the Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov). The thermostability of the irradiated samples was determined by means of an apparatus (Ref 10). At the same time, the dependence of the deformation on time was investigated at

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FREYDIN, A.S.; MALINSKIY, Yu.M.; KARPOV, V.L.

Effect of ionizing radiation on natural polymers. Carbohydrate-lignin complex and its components. Vysokom.soed. 1 no.5:784-790 M, '59. (MIRA 12:10)

1. TSentral'nyy nauchno-issledovatel'skiy institut stroitel'nykh konstruktsiy Akademii stroitel'stva i arkhitektury SSSR i Fiziko-khimicheskiy institut im. L.Ya.Karpova.
(Gamma rays) (Lignin)

FREYDIN, A.S.; MALINSKIY, Yu.M.; KARPOV, V.L.

Effect of ionizing radiation on the chemical stability of wood. Gidroliz i lesokhim.prom. 12 no.4:4-7 '59. (MIRA 12:8)

1. TSentral'nyy nauchno-issledovatel'skiy institut mekhanicheskoy obrabotki dereva (for Freydin). 2. Fiziko-khimicheskiy institut im. L.Ya. Karpova (for Malinskiy, Karpov).
(Wood--Chemistry) (Radiation)

BREGER, A.Kh.: Prinimali uchastiye: VAYNSHTEYN, B.I.; SYRKUS, N.P.; KYABUKHIN, Yu.S.; KOZLOV, V.A. KARPOV, V.L., red.; TARAKHOVSKAYA, N.K., red.; YAZLOVSKAYA, E., tekhn.red.

[Nuclear radiation sources and their application to radiochemical processes] Istochniki iadernykh izluchenii i ikh primenenie v radiatsionno-khimicheskikh protsessakh. Pod red. V.L. Karpova. Moskva, Vses.in-t nauchn.i tekhn.informatsii, 1960. 128 p. (MIRA 13:10)
(Radiation) (Radiochemistry)

TIKHOMIROVA, N.S.; MALINSKIY, Yu.M.; KARPOV, V.L.

Diffusion processes in polymers. Part 1: Diffusion of monatomic gases through polymer films of different structure. Vysokom. soed. 2 no.2:221-229 F '60. (MIRA 13:11)

1. Nauchno-issledovatel'skiy institut plasticheskikh mass i Fiziko-khimicheskiy institut imeni L.Ya. Karpova.
(Polymers) (Diffusion)

TIKHOMIROVA, N.S.; MALINSKIY, Yu.M.; KARPOV, V.L.

Diffusion processes in polymers. Part 2: Effect of the atomic diameter on the diffusion of gases in the polymer. Vysokom. soed. 2 no.2:230-237 F '60. (MIRA 13:11)

1. Nauchno-issledovatel'skiy institut plastmass i Fiziko-khimicheskiy institut imeni L.Ya. Karpova.
(Diffusion) (Polyethylene) (Polyamides)

15.8120 2209, 2109, 1526
11.2214

84502
S/190/60/002/004/002/020
B004/B056

AUTHORS: Novikov, A. S., Karpov, V. L., Galil-Ogly, F. A., Slovokhotova, N. A., Dyumayeva, T. N.

TITLE: Investigation of the Effect of Ionizing Radiations Upon the Chemical Structure of Rubber-like Fluorine Copolymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 4, pp. 485-491

TEXT: The authors proceed from published data (Refs. 1-5), according to which, unlike what is the case with polytetrafluoroethylene and polytrifluorochloroethylene, in the case of rubber-like copolymers, not destruction but structure formation is caused by ionizing radiation (radiation vulcanization). The authors therefore investigated this process on СКФ-32 (SKF-32) fluorine polymers. As a radiation source, a Co^{60} apparatus with an activity of 1,400 and 21,000 gram-equivalent of radium was used. The intensity of irradiation was $0.54 \cdot 10^6$ r/h; the total dose was $3 - 80 \cdot 10^6$ r. The copolymer films were irradiated in air

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Investigation of the Effect of Ionizing Radiations Upon the Chemical Structure of Rubber-like Fluorine Copolymers

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or vacuum (10^{-4} torr). The chemical changes occurring as a result of irradiation were examined by infrared spectroscopy. By means of an ИКС-14 (IKS-14) spectrometer, the spectra in the range from 500 to 1450 cm^{-1} were taken on 4μ thick films, and within the range from 1450 - 3500 cm^{-1} on 140 - 150μ thick films. Fig. 1 shows the infrared spectrum of the initial copolymer, which is interpreted by the authors. Irradiation in air leads to considerable changes (Figs. 2,3). The intensity of the absorption bands of oxygen-containing groups and of the $-CF=CF_2$ group increases considerably, while the intensity of the C-H, C-F, C-Cl bond stretching vibrations decreases. Herefrom it is concluded that gaseous compounds containing H, F, or Cl are liberated. Fluorine copolymer irradiated in vacuum shows a different spectrum (Fig. 4). At small doses (10.10^6 - $20 \cdot 10^6$ r), the absorption bands 1640 cm^{-1} (-CH=CF-); 1740 cm^{-1} ($-CH=CF_2$ or R-CF=CF-R); and 1840 cm^{-1} occur. The latter band is interpreted by the authors as belonging to the group $-CF=CF_2$. At higher doses, instead of the 1740 and 1840 cm^{-1} bands, a broad band with a maximum at 1800 cm^{-1} occurs. This is explained by the

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formation of cross links at the expense of the double bonds. The considerably decreasing solubility with increasing radiation dose (Fig. 5) confirms this assumption. An increased content of vinylidene-fluoride promotes cross linking (Fig. 6). A linear interrelation between cross links and vinylidenefluoride content was found (Fig. 7). At the same time, however, also destruction occurs, which manifests itself by decreasing viscosity (Fig. 8). The authors draw the conclusion that in the fluorine copolymer the same reactions occur during irradiation as in polyethylene: loosening of C-H bonds accompanied by the formation of free radicals and free hydrogen atoms, which either form compounds with neighboring H, F, or Cl atoms under the formation of double bonds and H_2, HF, or HCl, or take such atoms away from another polymer chain under the formation of a further free radical. The recombination of the free radicals leads to cross linking. With increasing copolymer content, the number of double bonds increases. There are 8 figures and 8 references: 5 Soviet, 1 US, 1 French, and 1 British.

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S/190/60/002/006/007/012
B015/B064

11.2210

AUTHORS: Yegorova, Z. S., Malinskiy, Yu. M., Karpov, V. L., Kalmanson, A. E., Blyumenfel'd, L. A.

TITLE: Chemical Changes of Polyvinylchloride Under the Influence of Ionizing Radiations

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 6, pp. 891-898

TEXT: The present paper investigates the dependence with time of the color change of PVC irradiated or non-irradiated under different conditions. The structural changes brought about by irradiation were also investigated. PVC powder samples and films (40, 180, and 200 μ thick) were irradiated at 293°K and 77°K in vacuum (approximately 10^{-4} torr), and stored in vacuum or in the air. Irradiation was made with fast neutrons with an energy of 200 kev, with a current density of 0.6 μ a/cm^2 being applied to the samples provided for determining the absorption spectra (on the СФ-4 (SF-4) spectrometer) and paramagnetic electron resonance, and for determining the infrared spectra 1.2 μ a/cm^2. An

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Chemical Changes of Polyvinylchloride Under the Influence of Ionizing Radiations

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electron accelerator with extracted beam was used as electron source. L. A. Vasil'yev irradiated the samples. In the infrared spectrum of the non-irradiated PVC (Fig. 1) a strong absorption band lies at 1256 cm^{-1} for the -CHCl- group (Ref. 8), at 1428 cm^{-1} for the deformation oscillations of the methylene group (Ref. 9), and at 1330 cm^{-1} for the CH group (Ref. 9), at 1097 cm^{-1} for the C-C bond of the carbon chain, at 960 cm^{-1} for the methylene group and the C-C bond of the carbon skeleton, as well as at 698 cm^{-1} for the C-Cl bond. The intensity of the 1256 cm^{-1} and 698 cm^{-1} band is reduced in the spectrum of PVC irradiated in vacuum at room temperature for 3 hours which indicates a reduction of the chlorine content, as well as of the 1428 cm^{-1} and 960 cm^{-1} indicating a reduction in the amount of methylene groups. In this connection conjugate double bonds are formed under the separation of HCl (new band in the range of 1720-1530 cm^{-1}). The further results obtained by spectral analyses and paramagnetic electron resonance indicate that the color change of PVC is due to processes occurring under the participation of radicals. By the method of the paramagnetic electron resonance the concentration of the radicals was found to decrease with time. In vacuum, this decrease is apparently due to a recombination of the radicals,

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B004/B060

21.6200 also 2209, 2109

AUTHORS: Tikhomirova, N. S., Malinskiy, Yu. M., Karpov, V. L.

TITLE: Study of Diffusion Processes in Some Polymers. III. Irreversible Variations of the Diffusion Characteristics Due to the Action of Gamma Radiation of Co^{60} on the Polymer

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 9, pp. 1335-1348

TEXT: The authors studied the dependence of the coefficient P of the permeability to gas, of the diffusion coefficient D, and of the solubility S of helium and argon on the irradiation dose (up to 1250 Mrad) at 25, 40, 60, and 70°C for films of polyethylene (0.4 mm), polyamide 4/10 (0.01 mm), methylol polyamide 2/10 (0.012 mm), CKC-30 (SKS-30) rubber (0.4 mm), and polytetrafluoro ethylene (0.06 mm). Apparatus, preparation of the films, and method of measurement are described in a previous paper (Ref. 19). Experimental data are provided as follows: 1) For polyethylene: (Figs. 1, 2, Table 1) P and D for helium and argon as a function of the irradiation dose; Fig. 3: dependence of the degree of cross-linking on the dose; Fig. 4:

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Study of Diffusion Processes in Some Polymers. III. Irreversible Variations of the Diffusion Characteristics Due to the Action of Gamma Radiation of Co^{60} on the Polymer

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relative heights of the peaks of X-ray diffraction in irradiated and non-irradiated material; Table 3: σ for He and Ar as a function of the dose; Fig. 9: log P, log D, and log σ as f(1/T) for non-irradiated material, as well as at 100 Mrad and 800 Mrad. 2) Polyamide and methylol polyamide: Table 2, Fig. 5: P and D as a function of the dose at 25 and 95°C; Figs. 6, 7: relative heights of the peaks of X-ray diffraction; Fig. 10: log P and log D as a function of 1/T for non-irradiated material, as well as at doses of 600 and 1250 Mrad. 3) Polytetrafluoro ethylene: Fig. 8: P, D, and σ as a function of the dose. Table 4 gives the activation energies E_D of diffusion, E_p of permeability, and the values for D_o - defined as log $D_o = f(E_D)$ (Fig. 11), as well as the enthalpy and entropy of the dissolution of gases in the polymers investigated with varying dose. Table 5 provides the solution heats of ethane, ethylene, propane, and butane in vulcanized natural rubber as a function of the sulfur content. Basing on these data, the authors arrived at the following conclusions: With increasing irradiation dose there is a decrease in the diffusibility of gases in polyethylene.

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Study of Diffusion Processes in Some Polymers. S/190/60/002/009/006/019
III. Irreversible Variations of the Diffusion B004/B060
Characteristics Due to the Action of Gamma
Radiation of Co^{60} on the Polymer

polyamides, and SKS-30 due to increasing cross-linking. In the case of polytetrafluoro ethylene, D begins to rise at 2 Mrad. At 8 Mrad, the permeability to Ar is 27 times greater than in the case of non-irradiated material; this fact is explained by the formation of microcracks. In the case of polyvinyl chloride, the permeability to Ar is quadrupled, and that to He is trebled, after 250 Mrad. In conformity with Ref. 26, the authors assume a cleavage of HCl, formation of double bonds, and a resulting greater solubility of gases, as well as the formation of microdefects. E_D, heat and entropy of the dissolution of gases increase with polyamides and drop with polyethylene. The drop of E_p is due to the drop of the dissolution enthalpy with increasing dose. Up to a cross-linking of 10-12%, the steepest drop of P and D occurs in polyethylene. D_o is a particularly sensitive characteristic of the structural changes undergone by a polymer under irradiation. The following after-effects were observed: With polyethylene and polyamides, heating leads to a further decrease of P and D;

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Study of Diffusion Processes in Some Polymers. III. Irreversible Variations of the Diffusion Characteristics Due to the Action of Gamma Radiation of Co^{60} on the Polymer

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with polytetrafluoro ethylene, this effect occurs already at room temperature. These effects, which are explained by the reaction of free radicals, were taken into account during the measurements. The authors thank B. I. Zverev for his determination of the crystal content of irradiated polymers by means of X-ray diffraction. There are 11 figures, 5 tables, and 29 references: 11 Soviet, 12 US, and 6 British.

ASSOCIATION: Nauchno-issledovatel'skiy institut plastmass (Scientific Research Institute of Plastics). Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: March 31, 1960

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83476

S/190/60/002/009/007/019
B004/B060

21.1200 also 2209, 2109

AUTHORS: Tikhomirova, N. S., Malinskiy, Yu. M., Karpov, V. L.

TITLE: Study of Diffusion Processes in Some Polymers. IV. Reversible Variations of the Diffusion Characteristics Under the Action of Irradiation

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 9, pp. 1349-1359

TEXT: In the present article, the authors discuss their studies dealing with the changes in diffusivity of gases through polymer films under the action of irradiation, and explain the reason why the direct measurement of the diffusion constant D gives rise to experimental difficulties, so as to make it preferable to measure the permeability constant P as a function of the time or irradiation τ (Fig. 1). Fig. 2 is a schematic representation of the experimental apparatus. A polyethylene or polytetrafluoro ethylene film was stretched across the diffusion cell made of stainless steel (Fig. 3). The space below the film was filled with helium or xenon (700 torr); the space above the film was evacuated to

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Study of Diffusion Processes in Some Polymers. IV. Reversible Variations of the Diffusion Characteristics Under the Action of Irradiation

$2 - 5 \cdot 10^{-3}$ torr. The pressure change in vacuum was measured by an induction manometer designed by V. B. Osipov (Fig. 4), the sensitivity of which was 0.05 torr per dial millimeter. The inductivity was recorded with an ЭПВИ-14 (EPVI-14) apparatus. Fig. 5 shows the calibration curve of the manometer. The diffusion cell was irradiated by means of Co^{60} in a K-20000 (K-20000) chamber. The diffusion cell was repeatedly introduced into the irradiation chamber and taken out again. Figs. 6-8 show the function $\Delta p = f(\tau)$ for helium - polyethylene, xenon - polyethylene, and helium - polytetrafluoro ethylene at radiation intensities attaining 730 roentgen/sec. Table 1 gives the effect of various radiation intensities on P. The following was observed: P rises at beginning irradiation and nearly drops back to the original value, P_o when irradiation is stopped.

In the case of polyethylene, P rises to the 10 - 15fold, and doubles in the case of polytetrafluoro ethylene. Xenon is diffused more quickly than helium. Fig. 9 shows that P/P_o is a linear function of the radiation intensity. Table 2 shows the effect of the temperature increase of the film on the permeability to gas. It may be seen that the latter was responsible

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Study of Diffusion Processes in Some Polymers. IV. Reversible Variations of the Diffusion Characteristics Under the Action of Irradiation

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B004/B060

for only 1/6 of the measured effect. Specific experiments made with an even more sensitive manometer (0.013 torr per dial millimeter, calibration curve Fig. 10) showed that the higher permeability to gas is not caused by an increased solubility of gases in the polymer irradiated (Table 3). A paper by Yu. S. Lazurkin et al. is mentioned (Ref. 1). There are 10 figures, 3 tables, and 4 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut plastmass (Scientific Research Institute of Plastics). Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: March 31, 1960

86318

S/190/60/002/012/001/019
B017/B055

21.6100
15.9206 2209

AUTHORS: Novikov, A. S., Karpov, V. L., Galil-Ogly, F. A., Slovokhotova, N. A., Dyumayeva, T. N.

TITLE: The Effect of Metal Oxides on Structural Changes in Fluorinated Rubber Copolymers Caused by Ionizing Radiation and High Temperatures

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 12, pp. 1761-1767

TEXT: The authors studied the effect of metal oxides (CaO, MgO) on the chemical changes in fluorinated rubber copolymers under the influence of ionizing radiation, applying a Co^{60} source with activity 21.000 gram-equivalents and intensity $0.54.10^6$ r/h. The chemical changes in the fluorinated polymers were investigated by infrared spectroscopy in the 4.000 - 1.300 cm^{-1} region on the ИКС-14 (IKS-14) spectrometer. The mechanical properties of irradiated fluorinated polymers with and without a metal oxide content are given in a table. The admixture of small

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The Effect of Metal Oxides on Structural Changes in Fluorinated Rubber Copolymers Caused by Ionizing Radiation and High Temperatures

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quantities of calcium oxide was found to increase polymer strength. The change in strength after irradiation of polymers containing varying amounts of calcium oxide is shown graphically in Fig. 1. The viscosity of methyl-ethyl ketone solutions of the polymers decreases after irradiation. The infrared spectra of fluorinated polymers type СКФ-32 (SKF-32) before and after irradiation, with and without calcium oxide, are shown in Figs. 5,6, and 7. A considerable number of conjugate double bonds of the type -CH=CCl-, and OH and HF_2^- groups were found to form in the presence of metal oxides. Metal oxides prevent the formation of volatile compounds during irradiation, since they react with these compounds. Calcium and magnesium oxide bind volatile compounds which form on heating fluorinated polymers to 200°C under pressure. The infrared spectra of fluorinated polymers before and after heating under pressure to 200°C, with and without admixture of calcium oxide are given in Fig. 8. In the irradiation of fluorinated polymers, the metal oxides act as acceptors for hydrogen-fluoride and hydrogen-chloride compounds and for fluorine, chlorine, and hydrogen. There are 8 figures, 1 table, and 11 references:

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The Effect of Metal Oxides on Structural Changes in Fluorinated Rubber Copolymers Caused by Ionizing Radiation and High Temperatures

S/190/60/002/012/001/019
B017/B055

5 Soviet, 3 US, and 3 British.

ASSOCIATION: Nauchno-issledovatel'skiy institut rezinovoy promyshlennosti (Scientific Research Institute of the Rubber Industry).
Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov)

SUBMITTED: May 11, 1960

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S/032/60/026/01/034/052
B010/B006

22 (5)
AUTHORS: Karpov, V. L., Malinskiy, Yu. M., Mitrofanova, L. V., Finkel', E. E., Fridman, A. S.

TITLE: Device for Determination of the Thermal Stability of Polyethylene- or Rubber Cable Insulations

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol 26, Nr 1, pp 102 - 103 (USSR)

ABSTRACT: The device mentioned in the title (Fig 1) consists essentially of an H-shaped frame standing on a steel plate. The latter has an opening in the middle of the crossbeam, through which the post with the loading weights is guided. At its top end, the post is fitted with a plate which transmits the pressure to the sample by means of two inset rodlets. The sample (a piece of cable with the insulation to be tested) is supported by two rodlets also. To indicate subsidence (sample deformation) of the last-mentioned plate by the indicator, the indicator is placed on the plate. Except for the indicator, the device is put in a thermostat, rendering possible sample heating at various rates up to 230°. The thermomechanical curves obtained for samples of high- and low-pressure polyethylene by means of the device described above

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Device for Determination of the Thermal Stability of Polyethylene- or Rubber Cable Insulations

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B010/B006

are given (Fig 2). The relative measuring error of this device is ± 5% at the maximum. There are 2 figures.

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5(4),21(8),15(8)

AUTHORS: Tikhomirova, N.S., Malinskiy, Yu.M., Karpov, V.L.

S/020/60/130/05/035/061
B004/B014

TITLE: Reversible Alterations of the Permeability of Polymers to Gases in the Gamma Irradiation Process

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 5, pp 1081-1084 (USSR)

ABSTRACT: As M.A. Makul'skiy and Yu.S. Lazurkin (Ref 5) had observed reversible effects in the irradiation of polymers, the authors investigated the effect of γ-radiation upon gas diffusion by polymers. Films of polyethylene and polytetrafluoroethylene were irradiated with Co^{60} (activity of 20 kg-equiv. of radium) with doses of up to 700 rads/sec. The rate of helium- or xenon diffusion by the film was manometrically measured. The design of the pressure gauge with a recorder of the type EPVI-14 was suggested by V.B. Osipov. The experimental apparatus is illustrated in figure 1. Figure 2 shows the function $p = f(\tau)$ for polyethylene at 10^6 and a dose of 730 rads/sec. Experimental data are compiled in table 1. Immediately after the introduction of the radiation source into

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the apparatus, pressure rises linearly with the radiation dose. When the source has been removed, the diffusion rate changes, approaches the initial rate, but remains higher. This hangover effect increases after each irradiation. The same results were obtained for polytetrafluoroethylene (Fig 3). In this case, test periods were, however, short because of the low radiation stability of this polymer. Figure 4 shows the temperature dependence of the rate of xenon diffusion by polyethylene. The acceleration of radiation-induced diffusion is explained by local excitation of molecules, increase in their elasticity due to primary absorption events of γ-quanta, and by secondary reactions. There are 4 figures, 1 table, and 7 references, 4 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L.Ya. Karpova (Institute of Physical Chemistry imeni L.Ya. Karpov). Institut promyshlennosti plasticheskikh mass (Institute of the Plastics Industry)

PRESENTED: July 30, 1959, by V.A. Kargin, Academician

SUBMITTED: July 14, 1959

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KARPOV, V.L.

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PHASE I BOOK EXPLOITATION SOV/5486

Vsesoyuznoye soveshchaniye po vnedreniyu radioaktivnykh izotopov i yadernykh izlucheniy v narodnoye khozyaystvo SSSR. Riga, 1960.

Radioaktivnyye izotopy i yadernyye izlucheniya v narodnom khozyaystve SSSR; trudy soveshchaniya v 4 tomakh. t. 1: Obshchiye voprosy primeneniya izotopov, pribory s istochnikami radioaktivnykh izlucheniy, radiatsionnaya khimiya, khimicheskaya i neftepererabatyvayushchaya promyshlennost' (Radioactive Isotopes and Nuclear Radiations in the National Economy of the USSR; Transactions of the Symposium in 4 Volumes. v. 1: General Problems in the Utilization of Isotopes; Instruments With Sources of Radioactive Radiation; Radiation Chemistry; the Chemical and Petroleum-Refining Industry) Moscow, Gostoptekhizdat, 1961. 340 p. 4,140 copies printed.

Sponsoring Agency: Gosudarstvennyy nauchno-tekhnicheskiy komitet Soveta Ministrov SSSR, and Gosudarstvennyy komitet Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii.

Ed. (Title page): N.A. Petrov, L.I. Petrenko and P.S. Savitskiy; Eds. of this Vol.: L.I. Petrenko, P.S. Savitskiy, V.I. Sinitsin, Ya. M. Kolotyrkin, N.P. Syrkus and R.F. Romm; Executive Eds.: Ye. S. Levina and B. F. Titskaya; Tech. Ed.: E.A. Mukhina.

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Radioactive Isotopes (Cont.) SOV/5486

PURPOSE: The book is intended for technical personnel concerned with problems of application of radioactive isotopes and nuclear radiation in all branches of the Soviet economy.

COVERAGE: An All-Union Conference on problems in the introduction of radioactive isotopes and nuclear radiation into the national economy of the Soviet Union took place in Riga on 12-16 April 1960. The Conference was sponsored by: the Gosudarstvennyy nauchno-tekhnicheskiy komitet Soveta Ministrov SSSR (State Scientific and Technical Committee of the Council of Ministers, USSR); Glavnoye upravleniye po ispol'zovaniyu atomnoy energii pri Sovete Ministrov SSSR (Main Administration for the Utilization of Atomic Energy of the Council of Ministers, USSR); Academy of Sciences, USSR; Gosplan USSR; Gosudarstvennyy komitet Soveta Ministrov SSSR po avtomatizatsii i mashinostroyeniyu (State Committee of the Council of Ministers, USSR, for Automation and Machine Building) and the Council of Ministers of the Latvian SSR. The transactions of this Conference are published in four volumes. Volume I contains articles on the following subjects: the general problems of the Conference topics; the state and prospects of development of radiation chemistry; and results and prospects of applying radioactive isotopes and nuclear radiation in the petroleum refining and chemical industries. Problems of designing and manufacturing instruments which contain sources of radioactive radiation and are used for checking and automation of technological processes are examined, along with problems of accident prevention in their use. No personalities are mentioned. References accompany some of the articles.

Card 2/12

KARPOV, V.L.

3

S/081/62/000/003/085/090
B162/B101

11.2211
15.9300

AUTHORS: Dogadkin, B. A., Tarasova, Z. N., Kaplunov, M. Ya., Breger, A. Kh., Kogerman, L. M., Vaynshteyn, B. I., Vizel', Ya. M., Karpov, V. L.

TITLE: Intensification of the process of radiation vulcanization and technical principles of an experimental installation for radiation vulcanisation of tyres

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 3, 1962, 595 - 596, abstract 3P275 (Sb. "Radiokt. izotopy i yadern. izlucheniya v nar. kh-ve SSSR, v. I", M., Gostoptekhizdat, 1961, 184 - 196)

TEXT: An investigation was made into the effect of medium (air and vacuum), temperature (from -196 to 100°C), sensitizers and inhibitors on radiation vulcanization under the action of Co^{60} γ - radiation of butadiene, butadiene-styrene and natural rubber. The degree of cross-linking in air is higher than in vacuum. In the presence of 2 % phenyl - β - naphthyl-amine the radiation-chemical yield of cross-links per 100 ev of absorbed

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B/081/62/000/003/035/099
B162/B101

Intensification of the process ...

energy drops by half for butadiene rubber in vacuum. The decrease in non-saturation is only partially explained by cross-linking and oxidation, and in the main this phenomenon is probably connected with the formation of intra-molecular rings. The cross-linking at different temperatures depends to a large extent on the structure of the rubber. Aliphatic polyhalides reduce the required radiation dose by half (to 25 Mr) and ensure the production of rubbers with a static strength equal to the strength of the best sulphur vulcanized rubbers. Vulcanization of rubbers containing carboxyl by the combined action of metal oxides and nuclear radiation (dose 10 Mr) gives vulcanized rubbers with high thermal stability and high strength properties. An investigation was made into the kinetics of the addition of styrene and 2,5 -dichlorostyrene to natural rubber and butadiene-styrene rubber and to mixtures of these with channel black with irradiation in Ar. An acceleration of vulcanization was observed in the presence of these monomers and vulcanized rubbers were obtained which possessed high thermomechanical stability and strength. The technical principles of a technological process for an experimental installation for radiation vulcanization of tyres are examined. Different types of γ-radiation sources were compared: radiation In-Ca loop of a nuclear reactor,

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S/081/62/000/003/085/090
B162/B101

Intensification of the process ...

spent-fuel assemblies, Co^{60} and different types of irradiators. A scheme is proposed for a technological process for an experimental installation with spent-fuel assemblies. [Abstracter's note: Complete translation]

Card 3/3

S/081/62/000/003/088/090
B159/B101

5.4600

AUTHORS: Tikhomirova, N. S., Malinskiy, Yu. M., Karpov, V. L.

TITLE: Irreversible and reversible changes of the diffusion characteristics of certain polymers as a result of the action of gamma radiation on a polymer

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 3, 1962, 644-645, abstract 3R65 (Tr. Tashkentsk. konferentsii po mirn. ispol'zovaniyu atomn. energii, 1959, v. I. Tashkent, AN UzSSR, 1961, 334-339)

TEXT: The diffusion of He, Ar, and Xe through films of polyethylene (PE), polyamide-54/10 (PA), methylolpolyamide-2/10, CKC-30 (SKS-30) and polytetrafluorethylene (PTFE) after gamma irradiation is studied. The constants of diffusion (D) and permeability (PR) were determined. In the case of He after a dose of 400 Mrads at 25 and 95°C, D and PR decreased for all polymers. On increasing the irradiation dose the activation energies of D and PR increase in the case of the polyamides; in the case of PE when the irradiation dose was increased to 400 Mrads the activation

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S/081/62/000/003/088/090
B159/B101

energies decreased and then remained practically constant. In all cases an aftereffect was observed. It was established that PR sharply increases at the initial moment of irradiation. PR assumes its initial value on removal of the source. The acceleration of PR grows as the dose rate is increased. It is assumed that the increase of PR is due to an increase in solubility of He, Ar, and Xe, or by an acceleration of D, or by both factors simultaneously. [Abstracter's note: Complete translation.]

33124

15.8520
9,2165 (1001, 1331, 1482)

S/638/61/001/000/055/056
B125/B104

AUTHORS: Karpov, V. L., Malinskiy, Yu. M., Mitrofanova, L. V., Slinitsyn, S. T., Finkel', E. E., Fridman, A. S. Chernetsov, S. M.

TITLE: Increase of the thermal stability of polyethylen-insulated lines by ionizing radiation

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent, 1961, 383-389

TEXT: A copper wire 1 mm in diameter and insulated with 0.5 mm of polyethylene was irradiated by a Co^{60} gamma radiation source of 20,000 g-equ. Ra in a vacuum as well as by an electron linear accelerator in the air. The thermal stability of the irradiated samples was determined by the analysis of the thermomechanical curves, i.e., of the time dependence of deformation under given load and with the temperature rising by a constant rate of 50 deg/hr, using a specially built device. The deformation that was attained is a measure of thermal stability at given temperature and load. The lifetime of the workpiece can be estimated from

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Increase of the thermal stability ...

the time dependence of deformation (likewise measurable by the above-mentioned device) at constant temperature and load. At increased temperatures the deformation is the lower, the higher the radiation dose, and remains practically constant up to 250°C. The restriction of deformation under a load of 0.5 kg to about half the radial thickness by irradiation with doses of 100-150 Mrad or by irradiation with 1-Mev (15 $\mu a/cm^2$) electrons for 2-4 min guarantees the usability of lines above 80°C. The final deformation is increased by a load increase without any change of its nature. The line still remains efficient if the load is quadrupled. The amount of final deformation is not affected by the rate of temperature increase over a wide range. The deformation is only little temperature-dependent under both long and brief load action. A line with irradiated insulation can be exposed to 180°C for at least 4 hrs, and remains efficient for some hours even at 230-250°C. If suitable stabilizers are introduced into polyethylene, the maximum operating time in this temperature range can probably be increased considerably, and the line can be exposed to even higher temperatures for a short time. The increased thermal stability improves the reliability of insulated wires at high temperatures, especially in the case of breakdown, and increases

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Increase of the thermal stability ...

the operating time at normal temperatures. Gamma irradiation in vacuo increases the stability at 20° and 90°C, while doses of more than 200 Mrad reduce it. The irradiation of 0.4 mm thick samples in the air reduces the relative elongation and also the tensile strength at 20° and 90°. The best strength properties are achieved by irradiation in vacuo with doses of up to 100 Mrad. The tensile strength of an insulation irradiated with fast electrons are presented in Table 1. Tensile strength, resistance to frost, electric breakdown and electrical resistance of a sample irradiated with a gamma dose of 100 Mrad or, equivalently, with 1-Mv electrons for 2-4 min were fully satisfactory. The resistance of line insulation to thermal aging drops with increasing radiation dose. Samples irradiated with electrons are more resistant in this respect than samples irradiated with an equivalent gamma dose. There are 6 figures, 6 tables, and 7 references: 5 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: Dolle M., Kelling C. D., Rose D. J. J. Am. Chem. Soc., 76, 4304, 1954; Charlesby A., Bain, T. Brit. Plastics, 30, 4, 146, 1957.

4

Card 3/4

Increase of the thermal stability ...

ASSOCIATION: Gosudarstvennyy n.-i. institut kabel'noy promyshlennosti (State Scientific Research Institute of Cable Industry). N.-i. fiziko-khimicheskiy institut im. L. Ya. Karpova (Scientific Physicochemical Research Institute imeni L. Ya. Karpov). Vsesoyuznyy elektrotekhnicheskiy institut im. V. I. Lenina (All-Union Electrotechnical Institute imeni V. I. Lenin)

Table 1. Tensile strengths of insulations irradiated with fast electrodes. Legend: (1) irradiation technique; (2) nonirradiated material; (3) voltage; (4) exposure (min); (5) tensile strength, kg/cm^2; (6) relative elongation, %.

(1) Режим облучения	(2) Необлученный материал	(3) Напряжение 0,6 Мв					1 Мв			
		(4) экспозиция, мин.								
		1	2	4	8	16	0,5	1	2	4
(5) Сопротивление разрыву, кг/см²	160	148	134	131	158	154	166	159	143	131
(6) Относительное удлинение, %	480	452	221	144	106	38	461	357	266	165

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34160

S/196/62/000/002/008/023
E194/E155

N.9300

AUTHORS: Blokh, G.A., Karpov, V.L., Malinskiy, Yu.M., Ol'shanskiy, L.P., and Khloplyankina, M.S.

TITLE: The action of ionising radiation on cable rubbers

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no.2, 1962, 14, abstract 2B 79. (Vestn. elektroprom-sti, no.8, 1961, 52-58).

TEXT: Cable rubbers and cable constructions were subjected to gamma radiation from Co^{60} in a source with an output of 21 000 g-equiv.rads. The specimens were irradiated to a dosage of 0.3 Mrad/hour. Radiation was found to cause some chemical changes in cable rubber which progesssively impaired its physical, mechanical and electrical properties. Radiation doses up to 50-100 Mrads on specimens in vacuum or immersed in water, causes smaller change in the properties of rubber than does irradiation in air. This indicates that oxygen participates actively in the processes that occur in rubber subjected to ionising radiation. On the simultaneous application of temperatures up to 70 °C and

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The action of ionising radiation ...

radiation for a period of 70 hours, rubber grade TC-35 (TS-35) was more stable than grade ШН-40 (ShN-40). Dosages above 100 Mrads caused complete breakdown of rubberised cloth. Graphs are given of changes in the physical-mechanical and electrical properties of various cable-insulating rubbers subjected to ionising radiation.
7 illustrations, 6 literature references.

[Abstractor's note: Complete translation.]

Card 2/2

21-6100 also 2209

S/020/61/138/001/019/023
B101/B231

AUTHORS: Bulanovskaya, Z. S., Varshavskiy, Ya. M., Karpov, V. L., and Petrov, I. Ya.

TITLE: Influence of gamma radiation of Co^{60} on isotopic exchange between hydrocarbon polymers and gaseous deuterium

PERIODICAL: Doklady Akademii nauk SSSR, v. 138, no. 1, 1961, 146-148

TEXT: In a previously issued work (DAN, 118, 315 (1958)) it has been demonstrated that ionizing radiation leads to isotopic exchange between the hydrogen of some polymers and deuterium. Experiments made at that time were based on the radiation of a water-moderated water-cooled reactor. It was the aim of the present work to give this effect a more detailed examination by applying pure gamma rays of Co^{60} and to find out whether such exchange also occurs in low-molecular hydrocarbons. Experiments were made in metal ampoules (20 ml) at a deuterium pressure of up to 150 atmospheres. The stuffing box of the ampoule valve was made of polyethylene. Its cover was provided with an end cap. After irradiation the deuterium pressure was measured, the sample was burnt in O_2 at a temperature of

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Influence of gamma radiation of...

900°C, and the deuterium concentration in the water of the combustion product was determined. As has been shown by control tests, long-lasting contact between polymer and deuterium fails to form heavy water in the combustion product. The polymers used in the process were polyethylene and polymethylmethacrylate. Fig. 1 shows the deuterium concentration in polyethylene as a function of the radiation dose, Fig. 2 as a function of pressure (dose, $200 \cdot 10^6$ r). Applying low pressure (up to 2 atmospheres) resulted in a rapid increase of the deuterium concentration which slowed down, however, when pressure was raised (up to 150 atmospheres). Experiments made at temperatures of 100°C and -196°C, at a dose of $80 \cdot 10^6$ r, and at a deuterium pressure of ~100 atmospheres showed that the deuterium content of polyethylene amounts to 0.25 atom%, whereas at the temperature of -196°C 0.08 atom% was obtained. The results stated hereinafter have been obtained with liquid low-molecular hydrocarbons:

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B101/B231

Influence of gamma radiation of.

Table 1

substance	originally weight-in quantity, g	pressure of D, atm, before irradiation	pressure of D, atm, after irradiation	concentration of D, atom%	yield, molecules per 100 ev
n-pentane	0.80	10	10	0.09	0.8
n-pentane	0.70	147	141	0.46	3.9
cyclopentane	0.50	10	10	0.18	1.3
cyclopentane	0.70	147	125	0.55	4.0
n-hexane	0.46	10	10	0.10	0.8
n-hexane	0.55	142	135	0.26	2.2
cyclohexane	0.43	10	10	0.02	0.1
cyclohexane	0.50	142	142	0.21	1.6
benzene	0.80	10	10	0.05	0.2
benzene	0.55	147	141	1.32	5.2

It has thus been confirmed that ionizing radiation initiates isotopic exchange of hydrogen between the C—H bonds. The type of radiation has no

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S/020/61/138/001/019/023
B101/B231

Influence of gamma radiation of...

sensible influence on this effect which must be taken into consideration when using radioactive indicators in the fields of chemistry and biology. There are 2 figures, 1 table, and 2 Soviet-bloc references

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute im. L. Ya. Karpov)

PRESENTED: December 12, 1960 by V. A. Kargin, Academician

SUBMITTED: December 8, 1960

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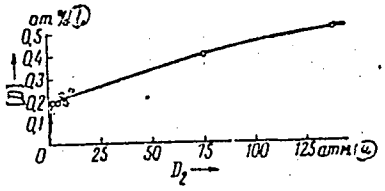
Fig. 1. [D] as a function of the radiation dose. Legend: a) integral dose; b) 10^9 r; c) atom%.

Fig. 2. [D] as a function of pressure. Legend: a) atm; b) atom%.



Card 5/5

S/191/62/000/004/002/017
B110/B138

15.8050

AUTHORS: Bubis, L. D., Karpov, V. L., Malinskiy, Yu. M., Yanovskiy, D. M.

TITLE: Polymerization of vinyl chloride under the action of γ-rays

PERIODICAL: Plasticheskiye massy, no. 4, 1962, 3-6

TEXT: Industrial PVC with 0.5 % impurities (vinylidene chloride, chloro ethyl, methanol, acetylene, β-chloro propylene, methyl acetylene) was polymerized by means of γ-rays (Co^{60}, 18,000 g-equiv Ra). The kinetics showed it to be a case of radical polymerization. There was a long induction period at -78, -20, 0, and 20°C and P = 15 rad/sec, due to removal of primary radicals which reacted with the impurities. The total activation energy was 4.7 kcal/mole calculated from the temperature dependence of rate of polymerization between 10 and 20 % conversion with constant radiation dose. This is quite close to the figures obtained for the radiation polymerization of methyl methacrylate (5.15 kcal/mole) and styrene (6.45 kcal/mole). It is lower than with initiated polymerization since under irradiation the radical formation is independent of temperature.

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Polymerization of vinyl...

The radiation dependence of the rate of polymerization is: $v = AP^n$, where A = const for a given temperature, n = 0.56 ± 0.07.. This indicates polymerization by the bimolecular mechanism. If the yield for 100 ev absorbed energy is calculated from the corresponding rates, $G = B/P^m$, where G = yield, B = const for a given temperature, m = 0.47 ± 0.04. Thus, an increased radiation dose accelerates polymerization but reduces the efficiency of the process. At -20 and 20°C and 1-15 rad/sec, the characteristic viscosity decreases with increasing dose. This raises the initiation rate and the concentration of active centers, which causes a reduction in polymerization. Viscosity increases with a temperature drop from 20 to -20°C. A further drop, however, lowers it. The temperature coefficient of the degree of polymerization is positive. This was observed in PVC polymerization between -78 and 20°C. The temperature dependence of the characteristic viscosity was anomalous between -20 and 20°C. This is due to increased probability of the chain being broken due to transfer via monomer and impurities, which may lead to a change of the molecular weight. Characteristic viscosity and decomposition temperature increased up to ~20 % conversion, falling with further increase. The initial decrease of characteristic viscosity and thermal stability is due to impurities which

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break the chain. The relative amount of impurities and their effect on the polymer properties decrease, and characteristic viscosity and decomposition temperature increase, as the degree of conversion rises. Destruction processes, formation of long-lived radicals and ramifications, occur under irradiation, which reduce characteristic viscosity and thermal stability. The color intensity increased with radiation dose owing to formation of conjugate double bonds. The polymer obtained at -20°C, $2 \cdot 10^5 - 5 \cdot 10^5$ rad had $T_v \simeq 100°C$; in radical polymerization, T_v = 75-80°C. Therefore, high-purity vinyl chloride must be used for radiation polymerization, and irradiation of the polymer should be avoided to preserve its stability. It is recommended that polymers insoluble in the monomer should be continuously withdrawn from the radiation zone. There are 9 figures. The most important English-language reference reads as follows:
A. Charlesby, Atomic radiation of Polymers, N.Y., 1959.

Card 3/3

32348
S/190/62/004/001/010/020
B101/B110

54600 1304

AUTHORS: Yegorova, Z. S., Malinskiy, Yu. M., Karpov, V. L., Kalmanson, A. E., Blyumenfel'd, L. A.

TITLE: Kinetics of disappearence of free radicals in irradiated polyvinyl chloride

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 1, 1962, 64 - 65

TEXT: The authors studied the decrease of concentration of free radicals in irradiated polyvinyl chloride in vacuo at 70 - 100°C by means of epr. Degassed polyvinyl chloride powder was irradiated with 200-kev electrons ($0.6\mu a/cm^2$) for 10 min in vacuo (about 10^{-4} mm Hg) at 77° K. The epr signal was recorded by the apparatus of A. G. Semenov, N. N. Bubnov (Pribory i tekhnika eksperimenta, 1, 92, 1959) and compared with that of the standard diphenyl picryl hydrazyl.

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Kinetics of disappearence of ...

Results:

Temperature, °C	70	80	90	100
$(1/T)\cdot10^3$	2.92	2.83	2.76	2.68
$k\cdot10^{22}$	0.06	0.28	2.76	8.04

T = absolute temperature. k = constant of the rate of disappearence of radicals (number of paramagnetic particles$^{-1}\cdot g\cdot sec^{-1}$). The function log k = f(1/T) is linear (second-order reaction). In the temperature range studied, the activation energy of recombination was 44-5 kcal/mole. There are 2 figures and 4 references: 2 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: A. A. Miller, J. Phys. Chem., 63, 1755, 1959; Z. Kuri, H. Ueda, S. Shida, J. Chem. Phys., 32, 371, 1960.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov). Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics AS USSR)

Card 2/3

32318
S/190/62/004/001/010/020
B101/B110

Kinetics of disappearence of ...

SUBMITTED: January 30, 1961

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Card 3/3

BUBIS, L.D.; KARPOV, V.L.; MALINSKIY, Yu.M.; YANOVSKIY, D.M.

Polymerization of vinyl chloride under the effect of gamma rays.
Plast.massy no.4:3-6 '62. (MIRA 15:4)
(Vinyl compound polymers) (Gamma rays)

S/844/62/000/000/094/129
D204/D307

AUTHORS: Karpov, V. L., Leshchenko, S. S., Mitrofanova, L. V. and Finkel', E. E.

TITLE: The effect of various additives on radiational cross-linking and thermal stability of irradiated polyethylene (PE)

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khmii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 547-553

TEXT: The aim of this work was to find suitable stabilizers for irradiated PE and thus increase its useful life at higher temperatures. The additives, i.e. soots and silica gels, a copolymer of phenol and styrene, $H_2N.C_6H_4.N(C_6H_5)_2$, dinaphthylmethane, dibutyl Sn maleate, dibutyl Sn stereate, dibutyl maleate, ß-naphthol, and phenyl-α-naphthylamine were mixed into PE by rolling and hot-pressing, in amounts of 1 - 15 parts by weight. The specimens were

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The effect of various ...

irradiated in air and vacuum (~100 Mrad, at 0.6 - 0.8 Mrad/hr), and their thermomechanical properties were studied at 150, 200 or 300°C. Channel and 'Vulcan' soots, the phenol-styrene copolymers $NH_2.C_6H_4.N(C_6H_5)_2$, and silica gel 'Aerosol' exerted no stabilizing action on PE; additives containing aromatic groups exerted a pronounced anti-radiation action; additions of silica gel type 'A' (SiO_2 containing uni- and polyvalent metallic admixtures) and of the organotin compounds exerted a strong stabilizing effect. The specimens containing 10 parts by weight of the above stabilizers had their useful life prolonged from 6 to 60 hours at 200°C and from 200 to 1500 hrs at 150°C. The effects of stabilizers depended on their content, the medium (air or vacuum) and temperature. Additives containing aromatic groups thus prevent cross-linking on irradiation but do not inhibit oxidative ageing processes, and vice versa. Organotin derivatives may participate in reactions proceeding through hydroperoxide radicals and leading to the formation of a network with oxygen bridges. The assistance of N. I. Sheverdina and L. V. Abramova,

who supplied the organotin compounds, is acknowledged. There are 3 figures and 2 tables.

ASSOCIATION: Fiziko-khimicheskiy institut L. Ya. Karpova; NII kabel'noy promyshlennosti (Physico-Chemical Institute im. L. Ya. Karpov; NII of the Cable Industry)

Card 3/3

S/844/62/000/000/099/129
D234/D307

AUTHORS: Blokh, G. A., Karpov, V. L., Malinskiy, Yu. M., Ol'shanskiy, L. P. and Khloplyankina, M. S.

TITLE: The effect of ionizing radiations on cable rubbers and structures

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 581-588

TEXT: Specimens were irradiated by a Co^{60} source. Up to a dose of 50 megarad the properties of rubbers changed relatively little. At higher doses, relative elongation decreases to less than a third and strength diminishes. Above 100 megarad complete destruction of rubberized fabric in cables is observed. In insulating rubbers strength decreases considerably, especially with 200 megarad. An increase of the dose to 350 megarad increases the strength again. In hose rubber ШН-40 (ShN-40) strength drops by 25 - 30% with 50 - 100 megarad, but between 100 and 300 megarad it became higher than

Card 1/2

S/844/62/000/000/100/129
D204/D307

AUTHORS: Mikhaylov, N. V., Tokareva, L. G., Bratchenko, T. D., Karpov, V. L. amd Malinskiy, Yu. M.

TITLE: The action of γ radiation on artificial fibers

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 589-595

TEXT: The effects of 0.05 - 1000 Mrad doses on polyamide and polyester fibers, and the possibility of improving the thermal stability of synthetic fibers and improving their adhesion to rubber by the addition of various monomers, were investigated. Polyethylene terephthalic fiber was practically unaffected under doses of up to 100 Mrad, owing to the stabilizing effect of the aromatic groups, whilst a caprone fiber was already affected at 1 Mrad. The specific viscosity (η) of 0.5% solutions of irradiated caprone filaments and single fibers (diameter respectively 0.03 and 0.7 mm) was measured. For the thinner fiber, η increased in vacuum and decreased

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The action of γ radiation ...

in air, whilst η of the monofiber increased when the latter was irradiated both in the presence and absence of air. This, and the changes in the strength and elongation showed that polyamide fibers undergo oxidative processes on irradiation; the greater changes in the presence of O_2 were particularly pronounced for the thinner fibers. Thin fibers underwent destruction when irradiated in air, whilst thicker specimens became structurized owing to the less ready diffusion of O_2 into the mass; structurization of the thicker fibers was also observed in vacuum. In contrast to the caprone fiber which was mainly structurized in both amorphous and crystalline states on irradiation, a terylene fiber was largely destroyed in the amorphous and structurized in the crystalline state. This difference in the behavior of polyamide and polyester fibers is ascribed to the considerably higher crystallinity of the latter. The above phenomena should be kept in mind when artificial fiber materials are to be utilized in practice. The effects of additions of acrylonitrile, styrene, toluyldiisocyanate, hexamethylenediisocyanate and vinylpyridine to the caprone fiber were studied, with

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doses of 0.01 - 50 Mrad, finding that in all cases, for a dose of 50 Mrad, the loss in strength was considerably reduced by the monomers, both at 20 and at 80°C. Acrylonitrile grafted on to the caprone fiber. There are 3 figures and 4 tables.

ASSOCIATION: Vsesoyuznyy nacuno-issledovatel skiy institut iskusstvennykh volokon; Fiziko-khimicheskiy institut im. L. Ya. Karpova (All-Union Scientific Research Institute of Artificial Fibers; Physico-Chemical Institute im. L. Ya. Karpov)

SANDOMIRSKIY, D.M.; KARPOV, V.L.; YURKEVICH, V.G.

Radiation vulcanization of rubber in latex. Vysokom.soed. 4 no.7:1064-1079 Jl '62. (MIRA 15:7)

1. Moskovskiy institut tonkoy khimicheskoy tekhnologii imeni Lomonosova i Fiziko-khimicheskiy institut imeni Karpova.
(Rubber, Synthetic)
(Vulcanization)

44271

S/190/63/005/001/014/020
B101/B186

11.2210

AUTHORS: Karpov, V. L., Pomerantsev, N. M., Sergeyev, N. M.

TITLE: Nuclear magnetic relaxation in irradiated rubbers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 5, no. 1, 1963, 100-107

TEXT: A study has been made of the nuclear magnetic resonance spectra of СКБ (SKB) butadiene rubber with 60 - 70% 1,2 bonds, and СКД (SKD) butadiene rubber with 90-95% 1,4 bonds. Irradiation was carried out with Co^{60} in doses up to 500 Mrad. Results: Non-irradiated SKB showed a line 0.2±0.02 oe broad. Upon irradiation, the intensity of this line decreased with increasing dose for SKB irradiated at 10^{-5} mm Hg or in air. Instead a line of 9.2±0.3 oe width appeared, the intensity of which increased with the dose. The spectrum of non-irradiated SKD was equal to that of non-irradiated SKB. With irradiated SKD, the intensity of the narrow line also decreased with increasing dose, and that of the broad line increased. The only difference was that the intensity of the narrow line still noticeable at high doses (150 - 300 Mrad) fell to the background noise at 70-80 Mrad with SKB irradiated in air, and at ~180 Mrad with SKB irradiated in vacuum, at

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Nuclear magnetic relaxation...

200-220 Mrad with SKD irradiated in vacuum. Measurement of the line width between -100 and +20°C showed that the motion of protons was inhibited at -90°C. This temperature corresponded to a line width of 9.1±0.4 oe. According to I. G. Powles (Polymer, 1960, 219) an activation energy of 1.5 -2 kcal/mole was calculated for non-irradiated SKB, and a correlation time τ_{cor} was found in the order of 10^{-7} - 10^{-8} while activation energies, calculated according to dielectric or mechanical relaxation methods, equal 30 and 39 kcal/mole. Conclusion: Irradiation converts the protons from a state with high correlation frequency, 10^5 - 10^6 cps, to an inhibited state with 10^1 - 10^2 cps; there is a transition state with 10^2 - 10^3 cps. Discussion of data found by H. S. Gutowsky et al. (J. Chem. Phys., 27, 537, 1957) concerning magnetic relaxations of rubber vulcanized with sulfur shows that the C-C cross linking due to irradiation is more solid than the one due to S-bonds because the potential barrier of rotation is lower for the latter. 3-5% of the protons remain uninhibited when the rubber is irradiated in air. Oxygen-containing cross links with low potential barriers are formed. There are 6 figures.

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KARPOV, V.L., SANDOMIRSKIY, D.M., YURKEVICH, V.G., SERGEYEV, N.M.

"Effect of gamma irradaition on natural and synthetic latexes."

Report submitted to the Conference on the Application of Large Radiation Sources in Industry, Salzburg, Austria 27-31 May 1963

KARPOV, V.L.

Radiation chemistry of polymers. Probl.fiz.khim. no.1:22-30 '58. (MIRA 15:11)

1. Laboratoriya radiatsionnoy khimii polimerov Nauchno-issledovatel'skogo fiziko-khimicheskogo instituta im. Karpova.
(Polymers) (Radiochemistry)

BREGER, A.Kh.; Prinimali uchastiye: KARPOV, V.L., kand.khim.nauk; BELYNSKIY, V.A.; OSIPOV, V.B., PROKUDIN, S.D.; TYURIKOV, G.S., kand.khim.nauk; GOL'DIN, V.A.; RYABUKHIN, Yu.S.; KOROLEV, G.N.; AFONIN, V.P.; POKROVSKIY, V.S.; KULAKOV, S.I.; LEKAREV, P.V.; FEDOROVA, T.P.; KOROTKOVA, M.A.; KHARLAMOV, M.T.; NIKOLENKO, G.D.; LOPUKHIN, A.F.; YEVDOKUNIN, T.F.; KASATKIN, V.M.; RATOV, A.V.

Nuclear radiation sources for radiational-chemical studies. Probl.fiz.khim. no.1:61-72 '58. (MIRA 15:11)

1. Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. Karpova.
(Radiochemistry) (Radioisotopes)

SHTEDING, M.N.; KARPOV, V.L.

Inhibiting properties of stabilizers studied by the thermomechanical method. Part 2: Organotin compounds as stabilizers of polyvinyl chloride under the effect of high temperatures and gamma rays. Vysokom. soed. 4 no.12:1806-1811 D '62. (MIRA 15:12)

1. Nauchno-issledovatel'skiy fiziko-khimicheskiy institut imeni Karpova.

(Tin organic compounds)
(Vinyl compound polymers) (Inhibition (Chemistry))

S/081/63/000/004/049/051
B156/B180

AUTHORS: Blokh, G. A., Zhurko, V. A., Zayonchkovskiy, A. D., Kiriyenko, N. V., Karpov, V. L., Breger, A. Kh., Tsipenyuk, E. V., Vyazankina, M. A., Bronshteyn, F. V., Bernshteyn, M. Kh., Yabko, Ya. M.

TITLE: The radiation vulcanization of rubbers and reclaimed rubbers together with plastics

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 4, 1963, 648 - 649, abstract 4T349 (Kozhevenno-obuvn. prom-st', no. 5, 1962, 17 - 20)

TEXT: The effects of exposure to radiation were studied on the physical, mechanical and chemical properties of the following combined systems of polymers: rubber СКС-30 (SKS-30), СКБ (SKB), НК(NK) - thermoplastics (low and high molecular-weight polyethylene, and polystyrene); ratios of thermoplastics to rubber of 0 - 100 % were used. The radiation dose (Co^{60}) was 1 - 100 Mrad. The plasticity, hardness, wear-resistance, strength, percentage, elongation, permanent set etc. were determined, and

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The radiation vulcanization of ...

plotted versus temperature in the 40 - 200°C range. The effect of irradiation on mixtures of rubbers with polyethylene or polystyrene is that cross-linking occurs between the two polymers, to form substances with valuable physical and mechanical properties: the plasticity is greatly reduced, while the strength, wear-resistance and heat-resistance are improved. Abstracter's note: Complete translation.

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AUTHOR: Gorodinskiy, S.M.; Karpov, V.L.; Nosova, L.M.; Panfilova, Z. Ye.; Rodionov, I.S.; Shteding, M.N.

TITLE: The development of a masticated rubber on a polyvinylchloride base for shielding against radioactive substances

SOURCE: Zashchitny*ye pokry*tiya v atomnoy tekhnike (Shielding in nuclear engineering); sbornik statey. Moscow, Gosatomizdat, 1963, 25-34

TOPIC TAGS: nuclear engineering, masticated rubber, nuclear shielding, radioactivity, polyvinylchloride polymer, radioactive shielding, radioactive contamination, residual activity, 57-40 rubber

ABSTRACT: It is pointed out that, of the industrial polymers produced at the present time, polyvinylchloride is, in terms of its inexpensiveness and mechanical and technological properties, the best material to serve as a base for shielding in nuclear engineering. The authors tested many masticated rubber materials on polyvinylchloride resin bases in terms of their sorption-desorption characteristic as a function of the type of polyvinylchloride resin, processing conditions and the presence of different components which provide for

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the required physico-mechanical and technological properties of the material. (By "sorption-desorption properties" the authors mean the ability of the material to absorb radioactivity and to be washed free of these radioactive substances through the effect of special cleansing solutions; the sorption- desorption characteristic is expressed by the residual activity of the material in percentages of the original contamination). The results of these tests are discussed. The optimal solution of the problem of developing a material to meet the specific operating requirements involved in working with radioactive substances was found in an entirely new principle of composition. This principle consists of the introduction into the composition of specially selected admixtures of hydrophobic substances which separate out on the surface of the masticated rubber in the form of a thin layer. The research conducted along these lines by the authors led to the possibility of developing on the basis of the most accessible polymer - polyvinylchloride - a new type of shielding material, called masticated rubber formula 57-40 and 80. This material is a thermoplastic and its physical and mechanical properties depend to a large degree on the temperature (its tensile strength, for example, changes with increasing temperature) and, for this reason, the formula use must be limited to a temperature interval of from 0 to 50C. The effect of the radiation dosage on the strength

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of the masticated rubber and on its elongation are discussed along with certain other specific characteristics of the material. The authors point out that formula 57-40 and 80 masticated rubber has successfully undergone tests under different conditions and is presently being widely used as a shielding material in radiochemical laboratories and at atomic power centrals. Easily deactivated and possessed of extremely high resistance to wear, this shielding material, produced in thicknesses of 2 and 3 mm, is particularly suited to continuous covering of floors and, produced in thicknesses of 0.3, 0.5 and 0.7 mm, may be utilized as a wall covering. The masticated rubber is available in colors of brown, orange, blue and white. "L.I. Kuz'mina and L.G. Danilova of the Okhtinskiy khimkombinat (Okhtinsk Chemical Works) took part in the work." Orig. art. has: 7 figures.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 20Feb64 ENCL: 00

SUB CODE: NP NO REF SOV: 000 OTHER: 000

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